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UROLOGY AND WARFARE.[1]

By PETER ROW,
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I HAVE CHOSEN as a subject for my address "Urology and Warfare". Before explaining this choice of subject I should like to say how much I have appreciated the honour bestowed on me when you elected me president for the past year. I also desire to thank my colleagues on the executive of the Urological Society of Australasia for their support and tolerance during the last twelve months. As a result of their cooperation my term of office has been less arduous and much more carefree than I had anticipated. However, pride in my accomplishment is modified by the knowledge that a favourable geographical location had much to do with my early election to this office, since the selection of a president is usually based on a practical plan—namely, that of appointing one resident in the State where the annual meeting will be held.

Though this system has obvious advantages, I agree with Dr. John Somerset that it would be better for the president to be a senior member, regardless of his particular address. During the past year we suffered a grievous loss in the death of Dr. John Laidley, a foundation member of this society and of its predecessor. It is most unfortunate that the late Dr. Laidley, one of the leaders of the speciality, should not have been president of this society at any time. The election of Dr. Edgar Reay, of Christchurch, as president-elect for the next Melbourne meeting is a very good move indeed.

My subject for this address has been chosen for the reason that much of the spare time that urology leaves me is devoted to the Royal Australian Army Medical Corps. Therefore, it seemed a good idea to link the two somehow. A more important reason is a belief that those of us who have had experience in the Royal Australian Army Medical Corps should collect their thoughts and views and hand their knowledge, for what it is worth, to a more efficient and enthusiastic generation of medical officers about to succeed us. It is easy to forget the lessons of the past. Many of us were amazed to learn that during the early phases of the Korean War, military surgeons made nearly all the old mistakes. This happened relatively soon after the end of World War II, and it seemed very unnecessary.

This subject of urology and warfare can be discussed under several headings. It will not be possible to deal with all these systematically or fully; but a few observations may have the good effect of encouraging others to interest themselves in some of the problems involved.

First, there is the question of the management of genito-urinary injuries of warfare. These concern the urologist

[1] Past President's address, delivered at the annual meeting of the Urological Society of Australasia, Surfers' Paradise, April 16 to 19, 1956.

very much. In the second place I think that one should mention infections, particularly non-specific infections, of the genito-urinary tract. These latter ailments in past wars have been responsible for serious loss of manpower. Thirdly, the urologist is a very important member of any team dealing with spinal cord injuries and paraplegia. Finally, since germinal epithelium is very sensitive to radiation, the advent of atomic warfare must be regarded as a threat to tissues devoted to our special care.

Genito-urinary injuries of warfare form a rather small proportion of wounds received under normal battle conditions. However, their importance is enhanced by their special effect on morale as a consequence of the great store set by the average soldier on his ability to procreate and to micturate effectively. Designers of protective armour should keep this in mind. An example of this concern for the safety of reproductive organs is found in a recent autobiography of the war. The author, a bomb-aimer, never went into action without two "Morris" hub caps carefully placed in position as he lay prone and exposed to enemy anti-aircraft fire. Under unusual conditions, such as warfare engaged against uncivilized foes, the incidence of genito-urinary injuries may on occasion increase so much as to dominate the whole picture. A classical example of this was the defeat of the Italian Army at the hands of the Abyssinians at Adowa at the end of the last century, when wholesale mutilation and eviration of the defeated Italians followed in accordance with an old Abyssinian practice. If any army needed expert urological aid it was on this occasion. The Abyssinian warrior performed his operation in a swift and ruthless manner. Seizing the scrotum and penis of his victim together with one hand, he removed the lot rapidly with a right-angled blade especially designed for the purpose. The operation was followed by a very considerable mortality. As with all urethral surgery, there was a high incidence of primary and secondary hæmorrhage. The post-operative stricture rate was also said to be considerable.

Lest you should think that this sort of thing is experienced only in warfare against savages, let me remind you that deliberate genital mutilations were not unknown in more recent wars waged against so-called civilized enemies. The male genitalia were frequent targets for the rubber truncheon and the jack boot as recently as World War II.

The Management of Injuries of the Genito-Urinary System.

Wounds involving the kidneys, ureters, bladder, urethra and male genitalia do not comprise a large proportion of battle casualties. For example, kidney wounds in some series comprise 5% to 7% of all abdominal wounds. Some 20% of thoraco-abdominal wounds (which are themselves not so frequent) involve the kidney and ureter. The vast majority of these injuries are associated with damage to other organs. For this reason a general surgeon is required in a forward operating unit rather than a urologist. In fact, enthusiastic specialists of any kind tend to be a hindrance in a forward area. It is in the general hospitals, especially those at the base, that the urologist will be of most value. Here he will deal with fistulas, strictures, retained foreign bodies and damage to genitalia. He will assist with the "spinal bladders". In field hospitals, however, there is a fair amount of urological work to be done. It would seem wise to have a urologist or at least a surgeon skilled in urological methods attached to each field hospital. If this could not be managed, then one should surely be attached to each group of field hospitals.

The correct principles in dealing with urological injuries should be impressed on all those dealing with battle casualties in forward areas. The forward surgeon should be aware of the necessity for free drainage and diversion of the urinary stream when dealing with injuries to the urinary tract. He should endeavour to conserve important organs and tissues, such as nephrons. In the case of ureteral injuries conservatism also is important. The forward surgeon should not remove a kidney until it has been shown to be dangerous to life or health or quite incapable of being saved. Wholesale nephrectomies, such as were occasionally performed during the first World War, had already given way to a more conservative attitude during the second conflict. One should explore the kidney often, but should remove it only when this is quite necessary. The management of urethral injuries is fairly well understood by most field surgeons. It is the duty of the first surgeon in attendance to establish urethral continuity, if possible, and to divert the urinary stream by means of suprapubic cystostomy, or occasionally urethrostomy.

Cystoscopic methods, including retrograde pyelography, are not likely to be used much in forward surgical centres, though they will be invaluable in assessing damage to kidneys at the base. Excretion pyelographic examinations, however, are easily managed wherever X rays are available. An injection of "Diodone" *et cetera* in cases of suspected renal or ureteral injury can do no harm and may well provide much information. It is very simple, and at least it will show the functional state of the contralateral kidney. No special preparation is needed. As such patients are usually dehydrated, some sort of concentration of "dye" may be expected.

The ureter is very deeply placed, and it is seldom damaged in battle. Indeed, ureters have far more to fear from pelvic surgeons. It would be safe to assert that many more ureters have been damaged by operations on the female pelvis than by the shot and shell of two World Wars.

In the case of injuries to genitalia, the utmost conservatism is necessary.

One of the most pathetic cases I have encountered was in 1943, when I treated a company sergeant-major of a famous Australian Imperial Force battalion. This soldier had joined the battalion in 1939 and served in all its campaigns. He was the last surviving original member of his company. His reward for all these years of active service was a perforating gunshot wound which involved both testicles. I can still see the look of gratitude which followed my promise that treatment would be as conservative as possible.

Of course, all raw areas should be covered with flaps or split skin grafts as early as it is safe to do so. It is said that the *tunica vaginalis* should be closed in order to discourage *hernia testis*. By these means the job is made easier for the reparative experts at the base. The implantation of testosterone pellets has been mentioned as worth while in uro-genital injuries.

Another clinical problem is the early management of the distended bladder, in cases of spinal injury. There is no doubt that manual expression may suffice occasionally. It is fairly certain that in many more cases a well-managed urethral catheter during the period of spinal shock is satisfactory. Efficient tidal drainage and even intermittent catheterization also have their advocates. The patient is thus tided over until the time when automatic control has been established.

However, as in the case of all military surgery, one must remember that personal control throughout is not possible. This applies particularly during the early phases of a war, when we spend much of our time retreating or withdrawing. Skilled nursing attention is by no means always available on lines of communication, particularly when we are not winning the war. For these reasons, and despite all the antibiotics, the methods employed must be simple and safe. In many cases in an average war a correctly constructed high cystostomy with an oblique fistula is best. The opening in the bladder should be made as small as possible. In such a case the suprapubic catheter may be removed, and the fistula will heal very rapidly when the patient reaches his destination at base.

I mentioned "average war", since the latter stages of the Korean War were not average. It would be a mistake to judge the excellent results and the methods employed as typical of what we may usually expect. Air transport of casualties may not often be as readily available as it was in Korea. It is with the "spinal bladder" that the urologist can be of great assistance later on. He may assist with bladder reeducation, cystometry, transurethral resection and pudendal nerve interruption.

With regard to genital injuries, one can scarcely expect to find many centres as complete as that described by Hugh Young after he had inspected French surgical installations during World War I. The surgeon in charge of one particular hospital took a pride in the functional results of his operations, which were tested on the spot. "Among the nurses", he said, "I have a group of patriotic young women who, when I request them, take a patient to whom complete reparation has been made, to a charming little room I have prepared as an adjunct to the hospital, and bring me the next day a faithful report as to the success of the operation. Ours is the only hospital", he added proudly, "in which the functional value of the member after operation is obtained."

Before leaving this subject of uro-genital injuries one should mention recumbency calculi. It is the urologist who will usually be called upon to treat such patients. Almost all these calculi are preventible. They occur commonly in cases of severe bone injury, especially if complicated by infection and decalcification. It is our duty to remind our colleagues that they may be prevented. Such patients should receive adequate amounts of fluid. The posture must be changed frequently, the genitalia should be kept clean, and urinary infection should be controlled by appropriate methods. Diet should include sufficient vitamin *A*, but not an excess of vitamin *D* (reduction of calcium in the diet, far from being helpful, is said to be deleterious). Finally the urine may be acidified. These rules should be written in letters of gold in all wards in which patients with this particular type of injury are nursed.

Genito-Urinary Infections.

The genito-urinary injuries of warfare from a military point of view are trivial and unimportant when compared with the genito-urinary infections. All urologists must be horrified on reading in the official histories of two World Wars of the tremendous wastage of manpower occasioned by such diseases. The incidence among Australian troops has usually been very high. For example, in the British occupation force in Japan during 1946, Australian troops supplied 25% of the force but 73% of the venereal disease. Whether this was a matter of enterprise, lack of moral sense or too much pay, is difficult to decide.

During the second World War, as sulphonamides and penicillin altered the outlook in the common venereal diseases, non-specific infections became increasingly important. Gonorrhœa, when reported early, became relatively innocuous. Syphilis, after the initial course of treatment, from a military point of view became mainly a matter of regular blood tests; but the patients with non-specific infections tended to languish in hospitals. The average stay in one large special hospital, during World War II, was reported to be fifty-two days. One cannot help wondering whether too high a standard of cure was set, and whether many patients were over-treated. Patients with persistent and relapsing infections should be fully investigated at an early stage by means of smears, cultures and panendoscopic examination, and this should be done before the infections become really chronic. The upper part of the urinary tract should be checked by excretion pyelography in these cases.

If no special reason can be found for persistence of infection, either the soldier should be returned to his own unit or his grading should be altered, if necessary. He should not remain in hospital a day longer than is essential.

In the next war regimental medical officers should be able to manage most of these cases after the acute and infectious stage has subsided. A system of recording in the paybook or elsewhere would be needed for serological tests at intervals lest syphilis be masked. It is suggested that the term "special" hospital be abandoned, and that all emphasis on venereal disease and genital infections as diseases apart should be removed. Most patients should be retained in the divisional area by management in the field dressing station or regimental medical establishment. The gonococcus should be regarded as just another pus-forming organism. A policy of less vigorous local treatment should diminish rather than increase such complications as stricture, epididymo-orchitis and anxiety states.

The prevention of such wasteful diseases consists in education and enlightenment of the whole community, for there is no real substitute for continence and personal responsibility. However, in both World Wars efforts based solely on appeals to moral sense were disappointing. Punishment, including reduction of pay, did no better and led to concealment. The worst possible method was evacuation to a base area. This policy reached its climax in the first war when, by June, 1916, 1358 men with venereal disease were actually returned to Australia from overseas. It is far better to make it as hard as possible for the infected soldier to leave his divisional area. As a means of prevention, individual prophylaxis has been of limited value only. Collective prophylaxis (the blue light centre) was more useful, provided that the methods used were not too vigorous. Such methods were highly developed in France during the first war, where, according to Hugh Young, certain Negro units of the United States Forces were encamped behind guarded barbed-wire fences. No Negro was allowed to return to camp without receiving a urethral lavage. The system was particularly hard on one coloured orderly who, with a smarting urethra, paraded himself before his commanding officer to request a new job that did not involve his leaving the camp area so often in the course of his duty.

Conclusion.

In conclusion, let me remind you that military medicine is an important branch of the science of war, its particular value being in preserving manpower and maintaining morale. I hope that some of us, and members of other specialities as well, may consider the relationship of their particular speciality to military medicine as a whole. The more we discuss our problems now, the better prepared we shall be in time of need.

Acknowledgement.

I am indebted to the Director-General of Medical Services, Major-General W. D. Refshauge, O.B.E., for permission to publish this address.

PROBLEMS IN THE ARTIFICIAL BREEDING OF LIVESTOCK.[1]

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ALTHOUGH the artificial breeding of livestock is frequently considered to be a new science, the earliest records date back to the fourteenth century, when semen was transferred from the vagina of one mare to another, with resultant pregnancy. This experiment was repeated sporadically with both the mare and the bitch throughout the centuries, but it was not until the turn of the present century that the development of artificial breeding gained impetus, largely as the result of the urgent need in Russia for livestock improvement. Today, artificial breeding plays an important role in the livestock industries of many countries. While undoubtedly artificial insemination has its greatest commercial use in dairy cattle, it has been developed successfully in equine, ovine, porcine, canine and poultry industries, quite apart from its application to laboratory animals and bees.

The Aims in Artificial Breeding.

Artificial breeding is frequently used as a means of overcoming herd infertility problems due to venereal disease; but so far it has not been used to any extent for the control of sporadic infertility in individual herds or

[1] Read at the annual meeting of the Urological Society of Australasia, Surfers' Paradise, April 16 to 19, 1956.

flocks. A much more important object is to make the maximum possible use of the genotype of outstanding parents, and it is for this reason that artificial breeding has been subsidized in its early development in certain countries. Although this object commends itself to official bodies, it is not in itself sufficient to encourage commercial primary producers to seek an artificial breeding service. Experience overseas shows that a commercial scheme becomes a success only when it is as cheap as natural breeding. Consequently, the investigator in this field is concerned not only in making artificial breeding physiologically possible, but also in accomplishing it in such a way that it is economically sound. Moreover, most producers like to select the parent stock to suit their breeding programme. We can, therefore, summarize the aims in artificial breeding as follows: (i) the provision of spermatozoa or ova in a physiologically suitable state; (ii) making continuously available the germ cells of any animal used for artificial breeding—that is, seven days a week, fifty-two weeks a year; (iii) making the procedure economically sound. This means that the cost of making an animal pregnant should be not greater, or only slightly greater, than by natural breeding, and that there should be no costly time delays. This, in turn, means that the conception rate must be normal—that is, the pregnancies resulting from every 100 inseminations should be in the region of 65 to 70 for most of the domestic animals.

Artificial breeding may take two forms—the transplantation of fertilized ova from one female to another, or the artificial transfer of semen from the donor to the recipient. There is, of course, the possibility of combining these manipulations, both of which may be considered under similar headings: (*a*) sampling from donor; (*b*) examination and storage of sample; (*c*) transplantation or insemination.

Ova Transplantation.

Transplantation of ova is a technique which is used fairly extensively for research purposes, but so far it has only limited application in commercial breeding. However, its potential value is great, since Hammond (1950) has pointed out that under modern methods of farming only some four calves are born during a cow's life-time, yet heifers have between 75,000 and 297,000 oocytes in their ovaries (Kappeli, 1908).

Ova Collection.

It is general practice to induce superovulation in the donor, in order to increase the chances of recovering ova. Moreover, it has in the past been necessary to kill the donor to obtain the developing blastocysts, which meant that a number of ova were required to make the technique worth while. The success of superovulation is quite remarkable, as Chang and Marden (1954) record the recovery of 30 to 40 eggs per doe. In cattle, Dowling (1949) and Brock and Rowson (1952) have investigated the most suitable methods for obtaining superovulation, while Willett, Buchner and Larson (1953) record the shedding of 16 and 18 ova from the donor cows. At this rate, the practice of ova transplantation would be worth while in special cases, even when allowance is made for the destruction of the donor. However, a more satisfactory approach is the development of a technique of flushing the ova from the live animal (Rowson and Dowling, 1949), but apparently one of the disadvantages is the risk of metritis. The ova in the case of cattle are collected four days after ovulation, and although the uterus in the œstrogenic phase is extraordinarily resistant to infection, in the progesteronal phase it is quite susceptible.

Storage of Ova.

The storage of ova over short-term periods has been carried out successfully, at least in the case of the rabbit. Chang *et alii* (1954) report the successful transport of rabbit ova from the United States of America to Great Britain, a journey of some thirty hours, the only precaution being the chilling of the ova to 12° to 16° C. Smith (1952) records attempts to store ova at −79° C., and although only six eggs divided normally in culture after the thawing of 556 frozen eggs, the results do indicate that with suitable modifications the technique may become successful.

Egg Transplantation.

The implantation of the fertile eggs has most frequently been accomplished by the performance of a laparotomy and their injection into the tubal-uterine region (Chang *et alii*, 1954; Willett *et alii*, 1953). However, for reasons of simplicity and economy, a technique of intrauterine implantation via the cervical canal is required. Such techniques, although previously tried, have the disadvantage, already mentioned, of leading to metritis, with consequent failure in conception. When storage of ova is not practised, implantation is most successful if both the donor and the recipient ovulate simultaneously. Otherwise, progesteronal therapy may be desirable.

Artificial Insemination.

Artificial insemination has received much more attention, probably because semen samples are easier to obtain and Nature is so lavish in the production of spermatozoa. Despite this, there are many problems, not least of which are the species differences. These may be exemplified in Tables I and II, showing the relative sizes of the male generative organs and the accessory genital organs, together with the approximate relationship between testicle size and body weight for the bull, the boar and the cockerel. It will be noticed that the accessory glands are relatively large in the boar and do not exist in the cockerel. The obvious result is that the volume of the ejaculate from the different species varies considerably, ranging from 250 millilitres in the boar to 0·8 millilitre in the cockerel. In addition, the sperm density tends to vary inversely with the volume. These data are shown in Table III.

We can classify our animals into two groups—the high density–low volume and the low density–high volume semen producers. So far, we have been able to extend the semen only of the former group for artificial breeding on a wide commercial scale, although pigs are bred artificially on a a commercial scale in the Philippines. In the present stage of our knowledge it is possible to extend one ejaculate from a bull for the successful insemination of several hundred cows, compared with the six to ten sows which may be inseminated from a single ejaculate of boar semen. This is because of the relatively low density of boar semen and the apparent physiological necessity for very large volumes of material for insemination.

Semen Collection.

For artificial insemination only very good or good samples are employed, fair and poor samples being rejected.

Table I.

Relation of Male Reproductive Organs to Body Weight.

Animals.	Average Body Weight. (Kilograms.)	Relative Weight of Organs (Grammes per Kilogram of Body Weight).				
		Testes.	Epididymis.	Seminal Vesicles.	Prostate.	Bulbo-urethral Glands.
Bulls (7)	264	1·88	0·22	0·32	?	?
Boars (4)	95	6·49	1·91	1·57	?	2·10
Cockerels (2)	1·88	4·66	—	—	—	—

Accordingly, techniques have been developed to ensure the collection only of the best quality semen, not only as regards sperm density and motility, but also bacterial contamination. In practice, the best way to ensure this is to build up conditioned reflexes in the donor. The same environment is used each time, and a certain sequence of events is followed prior to collection; for example, in some centres it is customary to withhold feed from the bulls on the mornings on which they are to be used. Despite this, difficulty may be experienced on occasion in obtaining a satisfactory sample, and various forms of stimulation are necessary, such as teasing the bull by leading him back to his stall, arousing his anger, or bringing out another bull to make him jealous. Occasionally it may be necessary to resort to electrical stimulation. This may be accomplished by placing ring electrodes on two fingers of the operator's gloved hand, which is then inserted into the bull's rectum (Rowson and Murdoch, 1954). The stimulation is applied to the *ampullæ ductus deferens*, increasing sine waves being recommended. A modification of this technique with a rectal bipolar probe is used extensively in sheep, but so far only limited success has been noted in the boar and dog (Dzuik, Graham, Donker, Marion and Petersen, 1954). It is probable that in the last-mentioned animals further developments in the application of the stimulation and in voltage control will be forthcoming. It is worthy of note that electrical stimulation is most satisfactory in those animals which complete their ejaculation quickly. Thus, in the bull and the ram, erection of the penis is due largely to muscular action in straightening the zigmoid flexure of the penis, and coitus is complete in a matter of seconds. In the pig and dog, however, ejaculation proceeds over a period of ten to twenty minutes. Because of this, it is much more difficult to obtain samples of adequate cleanliness for treatment from the latter animals.

TABLE II.

Male Accessory Reproductive Organs as a Percentage of Testicular Weight.

Organs.	Bull.	Boar.
Epididymis	12	29
Seminal vesicles ..	19	27
Bulbo-urethral glands ..	?	32

TABLE III.

Semen Characteristics of Different Species.[1]

Animal.	Average Volume of Ejaculate. (Cubic Centimetres.)	Average Density. (Millions per Cubic Centimetre.)	Storage Survival Time (Days).
Boar	200	100	0·25
Stallion	100	60	0·5
Bull	3·5	800	4 to 5
Ram	0·9	2000	5 to 6
Cockerel	0·8	4000	0·25

[1] Data from Perry (1945).

It has been found by trial and error that the frequency of collection must be considered. One collection per week is usually regarded as optimum for bulls, although more than one ejaculation may be permitted on that occasion. Many bulls will perform satisfactorily with more frequent collections over a short period, but the long-term effect is a reduction in semen quality. This means that, if the maintenance of seven bulls of each breed at a centre is to be avoided, some form of semen preservation must be adopted.

Examination and Storage of Semen.

Much effort is being expended towards the discovery of suitable laboratory tests for the evaluation of semen, especially with regard to its fertility. The semen samples are generally examined for volume of ejaculate, density and motility. Periodically, the semen may be examined for longevity, percentage of live sperms on collection, percentage of abnormal sperms, fructolysis and methylene blue reduction. Unfortunately, it has not been possible to link any one of these tests, or combination of tests, very closely to fertility. The best index would appear to be impedance change frequency (Bishop, Campbell, Hancock and Walton, 1954), which is a measure of density and motility, although other tests have been reported as useful (Buckner, Willett and Bayley, 1954). Volume of ejaculate has also been shown to be associated with fertility level. However, cases have been observed in animals in which the semen appears normal, but in which there is evidence of subfertility; our only reliable measure of fertility is based on non-return-to-œstrus data for the inseminated females.

One of the main duties of the officer in charge of an artificial breeding centre is to observe the fertility rate. The over-all conception rate is influenced by the incidence of disease in the recipient herds, by the personnel carrying out the inseminations, and by the bulls themselves. The bulls can vary very rapidly at any time, and a number of managemental factors can be associated with this. Undoubtedly, nutrition of the bulls is the most important factor, since suboptimum intakes of protein, vitamins or minerals may have serious effects, although Mann and Walton (1953) record in a bull a period of submaintenance feeding of twenty-three weeks' duration without adverse effects on visual semen quality. Other bulls seem to have a chronic low fertility rating, which in some cases may be inherited, but in others can be influenced by appropriate treatment of the semen. Thus it has been shown that the addition of antibiotic to the semen diluent at the rate of 1·5 milligrammes of sulphanilamide per millilitre, 500 international units of penicillin per millilitre, or 500 microgrammes of streptomycin per millilitre may be beneficial (Campbell and Edwards, 1954). The mode of action of the antibiotic is not clear, since there is no evidence of gross bacterial contamination of the semen.

Another additive which is of benefit is glycerol. Although it may raise the conception rate by 4% (Holt, 1953), it is not generally used because of the care with which it must be added to the semen.

Short-Term Storage of Semen.

The aim of short-term storage is to retain the semen of any given donor until the next collection is due. This means that the semen should remain reasonably fertile for seven to ten days. The standard practices at present in use for bull and ram semen give commercially satisfactory results for only about sixty hours, after which the conception rate falls below economic limits. In the case of boars it is doubtful whether quality can be maintained even for that time. The usual preservative is egg yolk–citrate (a mixture of equal parts of egg yolk and 3·6% sodium citrate, pH adjusted to 6·8), but other diluents are now being tried. There is evidence that sodium carbonate is better than citrate, inasmuch as it gives a better conception rate on the second day (Rickard, Ludwick, Hess and Ely, 1954), and it may be that a reduction of sodium in favour of potassium would be advantageous. Other workers are aiming at the elimination of egg yolk from the media, and have found that boiled skimmed milk is very successful, although not more so than egg yolk–citrate (Bolton and Durrell, 1954). However, boiled skimmed milk does possess the advantage of being readily sterilized.

As with other aspects of artificial insemination, the horse and pig present the greatest difficulty, in that egg yolk–citrate is not a satisfactory diluent. However, egg yolk–glycine now shows promising results (Roy, 1955) and there is evidence that this medium may increase the duration of motility of stored bull semen by 50% (Roy and Bishop, 1954).

A review of the literature fails to reveal any depth of investigation into the optimum medium for dilution of semen for short-term storage. The diluent must obviously protect the spermatozoa from temperature shock and increasing acidity; but because of the success of simple

diluents no effort has been made to discover which factors, if any, in seminal plasma may be valuable in prolonging sperm life. Thus it is only comparatively recently that Rotheschild and Barnes (1954) drew attention to the osmotic pressure of different diluents in common use, and demonstrated how far they deviate from that of seminal plasma. It would appear that the increase in survival time of spermatozoa under present methods of storage could be almost totally explained on the grounds of decreased metabolic rate associated with chilling. Advancement in this field must obviously take into consideration the maintenance of an optimum osmotic pressure, the provision of nutrients and the removal of metabolites. This presumably occurs under conditions of in-vivo storage in the epididymis, since a bull can produce high quality semen on his first ejaculate after a fortnight's rest, yet if semen is collected after a week's rest we cannot maintain it *in vitro* in a highly fertile state for the second week.

According to Marshall (1952), sperm can be maintained in the epididymis of the bull for up to sixty days and still show oscillating movement; yet Roy *et alii* (1954) record movement in stored semen for only twenty days with egg yolk–citrate and for thirty days with egg yolk–glycine, both of which media were assisted by chilling of the spermatozoa. We may eventually find that if we can master the metabolic requirements of semen, storage in an incubator will be preferable to storage in a refrigerator.

A line of research which has a bearing on these thoughts is at present being followed by a group of students at the University of Queensland Veterinary School. It has long been known that maximum fertility may be obtained in poultry by mating them only every five days, that 50% of the eggs laid by a hen may be fertile ten days after the removal of the cockerel from the pen, and that fertile eggs may be obtained for up to three weeks. In contrast, the spermatozoa of mammals survive in the female genital tract for only one or two days. The problem has not hitherto been investigated on a comparative basis, but the aim of the current investigation is to determine whether the longevity is a function of the semen or of the female reproductive tract. It is notable that the cockerel, unlike mammals, does not have any accessory reproductive organs, nor is the *ductus deferens* glandular. This means that the semen of the cockerel as it is emitted, and probably as it is stored in the oviduct of the hen, may be of similar composition to that in the epididymis of mammals. In other words, it is possible that the accessory reproductive organs have the effect of reducing the life span of spermatozoa, possibly by stimulating their metabolic activity. Evidence in support of this view is quoted by Marshall (1952). On the other hand, the longevity of the semen may be a function of glandular secretion in the hen, since she is continuously "in œstrus" and ovulating, whereas in mammals œstrus is only of limited duration. If it is a function of female glandular secretion it is probably associated with ovulation rather than with œstrus, since the mare may be in œstrus for up to fifteen days, yet the survivability of spermatozoa appears to be low.

Long-Term Storage of Semen.

The long-term storage of semen has had considerable emphasis during recent years, since it was discovered that the addition of glycerol to semen permitted freezing to −79° C. However, the technique is laborious, and it is unlikely that the method will be widely adopted except as an insurance against premature death of valuable sires. Its only other probable application is in those areas where seasonal breeding is practised, necessitating a heavy demand for semen supplies over short periods.

As with the present methods of short-term storage, longevity is dependent on the reduction in metabolic rate, in this case, to virtually zero.

Apart from the laborious and, therefore, expensive features of deep-frozen semen, a number of problems present themselves. There are, for example, verbal reports that not all bulls produce semen which will tolerate the deep-freezing technique. Moreover, experiments so far recorded have dealt with the freezing of only small samples of diluted semen, say in aliquots of one cubic centimetre. While this is quite suitable for the bull and ram, evidence to date indicates that volumes of 50 cubic centimetres are required for the insemination of the sow. We are, therefore, left with the problem of either attempting to freeze boar semen in 50 millilitre samples, which, from American work with bull semen, yields lower conception rates (Bretton, Foote and Cruthers, 1954), or of concentrating the semen, freezing it, and finding a suitable diluent when the material is thawed and ready for insemination.

Apart from these considerations, work is still proceeding on the technique of deep-freezing semen, especially in regard to the best method of introducing the glycerol (which is lethal to spermatozoa in moderate concentrations), the concentration of egg yolk and buffer and the inclusion of sugar in the diluent. From the present available literature it would appear that a final concentration of 7% glycerol and 20% egg yolk is optimum (Saroff and Mixner, 1955), while arabinose is probably the most satisfactory sugar used in a concentration of 1·25% (Blackshaw, 1955). It is interesting to observe that only about 30% of the spermatozoa may survive the process, yet the conception rate may be as high as with unfrozen samples (Hafs and Elliott, 1955).

Insemination.

The usual technique of insemination is to insert a glass pipette through the cervix and deposit one millilitre of treated semen into the uterus; while deep intracervical insemination gives almost as good conception rates, intravaginal insemination gives poorer results. Because it is desirable that the technique be carried out properly, it is usual to employ semi-skilled operators. This means that a major cost in a commercial breeding service is the maintenance of field staff and suitable vehicles, which is one reason why cattle-breeding centres are situated in regions of high cow density. For Australian conditions there is an urgent need for the development of insemination techniques which may be employed by untrained persons.

The use of gelatin capsules for deposition in the anterior part of the vagina has been tried in Russia (reported by Sorensen, 1946), but obviously suffers the disadvantage of low conception rates unless large doses are used. However, a pointer to the future may be the report by Skjerven (1955) on the successful induction of pregnancy in a heifer by intraabdominal deposition of semen. Such a technique, if successful, may prove of infinite value in pig breeding, since it is possible that the large volume of semen required in this species may be attributed to the extremely long uterus (about four or five feet) even in the non-gravid sow.

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THE MECHANISM OF EJACULATION.[1]

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EJACULATION may be defined as the expulsion of semen to the exterior by the rhythmic contractions of the penile muscles. Contractions commence in the *vasa efferentia* of the testis, then pass along the epididymis and vas, which contract almost simultaneously with the seminal vesicle, to the ejaculatory duct, and continue along the urethra. Prostatic fluid is added by the contraction of the surrounding muscle. This is accompanied by a psychological release also in ordinary coitus, to constitute the orgasm. Ejaculation usually involves the activity of the highest cortical levels, but may be purely reflex.

A discussion of ejaculation necessarily involves also that of erection. This will be assisted by a review of the regional neuro-anatomy.

Neuro-Anatomy.

The epididymis, *vas deferens*, seminal vesicle and prostate have an autonomic nerve supply only. The external urinary sphincter, the bulbo-cavernosus and ischio-cavernosus and the urethral muscles have a somatic innervation, via the perineal branch of the pudendal nerve (second, third and fourth sacral segments). The bladder neck is usually regarded as being supplied by the autonomic only, but some consider that it also has a somatic innervation. Bors (1952) has shown that electrical stimulation of the pudendal nerve in man is associated with a strong contraction of the bladder neck. This he ascribes to a striated muscle component of the bladder neck, and accordingly postulates a double innervation to this area—the presacral nerve and the pudendal.

First, let us consider the sympathetic supply. The presacral nerve (superior hypogastric plexus) divides, at the level of the first part of the sacrum, into the two hypogastric nerves. These terminate one on each side of the rectum in the hypogastric plexuses (inferior hypogastric or pelvic plexuses). The inferior hypogastric plexus is more widely spread than this classical description (Mitchell), and covers also the prostate, the seminal vesicles and the posterior parts of the infero-lateral surfaces and base of the bladder. The filaments to the vesicles also give rise to peri-ureteral nerve loops. They assist in the innervation of the ejaculatory ducts, and occasional filaments pass down the vas to the epididymis.

The filaments supplying the prostate also supply the prostatic part of the urethra and the ejaculatory ducts. Terminal filaments communicate with filaments of the pudendal nerves. The prostatic plexus also gives rise to the cavernous plexus of the penis (Kuntz). This supplies the *corpora cavernosa penis* and the *corpus spongiosum penis*.

Mitchell also describes middle and inferior gonadic nerves. The middle gonadic nerves arise from the presacral nerve. They run with the testicular artery and supply the epididymis and proximal *vas deferens*. The inferior gonadic nerves arise from the nerve loops around the lower end of the ureter and from the adjacent inferior hypogastric plexus. These filaments supply the remainder of the *vas deferens*. One large filament continues to the epididymis, which it supplies, including the ductules of the epididymis (*vasa efferentia*).

The body of the testis is supplied by nerve fibres accompanying the terminations of the testicular artery. These arise from the aortic and renal plexuses. It is generally thought that these fibres supply blood vessels only, and not the seminiferous tubules or interstitial cells.

The innervation of the testis and epididymis is complex, and it is not possible to delineate its exact derivations (Mitchell).

The parasympathetic supply is via the *nervi erigentes*, which arise from the anterior primary rami of the second, third and fourth sacral nerves. They join the inferior hypogastric plexus of the ipsilateral side. McCrea describes an accessory parasympathetic supply, which runs laterally in the endopelvic fascia in association with the blood vessels. These fibres are derived from the anterior nerve roots of the second, third and fourth sacral segments.

As erection and ejaculation are fundamentally reflex in nature (and can occur quite efficiently in spinal man), cord centres have been postulated.

Kuntz states that "in view of all the data available, the existence of a sacral centre which mediates erection and a lumbar centre which mediates ejaculation may be regarded as established. . . . ejaculation can not be mediated through the sacral centre". It is certain that the mechanisms of erection and ejaculation are by different nerve supplies.

Afferent impulses from the *glans penis* are carried to the cord via the dorsal nerve of the penis (branch of the pudendal nerve). These afferents are carried in the spino-thalamic tracts and relay in the thalamus and sensory cortex. Erection and ejaculation, either together or singly, may be greatly reinforced or inhibited by higher centres.

The genital ducts have a smooth muscle coat. The bulk of the epithelium of the *vasa efferentia* of the epididymis is ciliated, the duct of the epididymis is lined by an epithelium containing non-motile stereocilia, and the epithelium of the vas has stereocilia. The epithelium of ampulla of the vas and the seminal vesicle is non-ciliated (Maximow and Bloom).

The Mechanism of Erection and Ejaculation.

The classical description of erection and ejaculation will first be noted.

[1] Read at the annual meeting of the Urological Society of Australasia, Surfers' Paradise, April 16 to 19, 1956.

In man, higher centres alone may suffice for both erection and ejaculation without genital stimulation. In some animals there exists an ejaculatory centre in the cerebrum, stimulation of which alone will produce ejaculation (for example, the guinea-pig). Judicial hanging is often accompanied by ejaculation. In the adult, these centres are influenced, to an extent, by the sex hormones.

Erection may occur without ejaculation, and vice versa, or erection and ejaculation may occur at a purely spinal level as in paraplegics.

Erection is due to parasympathetic stimulation via the *nervi erigentes*. They produce relaxation of the muscle coat of the arterioles in the penis and of the muscles and erectile tissue. The penile arteries are consequently tortuous, to allow for the increase in length during erection. It is unlikely that compression of the dorsal vein of the penis occurs, or if it does, that it contributes appreciably. For instance, division and ligation of the deep dorsal vein, as a cure for impotence, is not successful. The blood in the cavernosus spaces during erection is not stagnant, but there is a constant minimal circulation. This is evidenced clinically by the long period during which priapism must persist before thrombosis occurs. Further, erection depends on a continuance of the blood supply. Semans and Langworthy (1938) showed in the cat that compression of the aorta caused subsidence of the erection.

Finally, ejaculation occurs when there is summation of afferent stimuli in the ejaculatory centre of the cord, to reach threshold level.

The efferent stimuli then cause contraction of the smooth muscle of the whole of the genital ducts—that is, the *vas efferentia* and duct of the epididymis, the *vas deferens*, the ampulla of the vas, the seminal vesicles and the prostate. This produces semen in the posterior part of the urethra, which in turn stimulates the contraction of the bulbocavernosus and ischio-cavernosus and the urethral muscles. Thus the act is completed by reflex contraction of voluntary muscle. The internal sphincter of the bladder is also stimulated to contract, and possibly the verumontanum is drawn cranially (Rose). Ejaculation is thought to be mediated by the sympathetic system. Orgasm is accompanied by other autonomic effects—tachycardia, increased blood pressure and respiration rate, perspiration *et cetera*.

This description is mainly based on Learmonth's work (1931). He stated that stimulation of the presacral nerve in man produced (*a*) contraction of the ureteric orifices, (*b*) increased tonus of the trigone, (*c*) contraction of the internal sphincter of the bladder, (*d*) contraction of the prostatic muscle with the production of fluid in the posterior part of the urethra, (*e*) contraction of the vesicles and ejaculatory ducts, and (*f*) contraction of the vessels of the trigone.

The sequelæ of operations on the sympathetic nervous system are important in this regard. White and Smithwick (1952), from an analysis of 183 cases, state that absence of ejaculation is permanent in 15% of cases after thoracolumbar sympathectomy carried down through the first lumbar ganglion on both sides, but that dry intercourse does not occur when the first lumbar ganglion is left on one side. When the upper two lumbar ganglia are resected, 37% of subjects have permanent loss of ejaculation. After bilateral lumbar sympathetic ganglionectomy, 54% of subjects have no ejaculation, if the upper three ganglia are resected on one side and two or more on the other. White and Smithwick conclude with the following concept:

> . . . in certain individuals the outflow from the first lumbar ganglion and possibly the lowest thoracic ganglia is of major importance in the innervation of the seminal vesicles and ducts, while in others the fibres running through the lumbar ganglion are of equal importance. There is no set rule for this distribution, a fact which corresponds with the well-known irregularities in the arrangement of the lumbar ganglia and the tendency to pre and post-fixation of the spinal sympathetic outflow.

White and Smithwick agree that the power of erection is under parasympathetic control. They can offer no satisfactory explanation for the infrequent occurrence of impotence following the above-mentioned operations.

Pende (1937) thought that some types of functional impotence could be due to sympathetic hyperexcitability. He described pronounced improvement in a functional impotent after bilateral lumbar sympathectomy. This was accompanied by loss of ejaculation. Even though the sympathectomized male may have no ejaculation, at the time of orgasm he may have the sensation of ejaculation. This is because the bulbo-cavernosus and ischio-cavernosus muscles still contract, as they are supplied by the pudendal nerve. The psychological orgasm may thus be unimpaired.

Rose (1953) investigated the incidence of sterility following lumbar ganglionectomy. His conclusions differ from those of White and Smithwick. In 30 cases of bilateral lumbar sympathectomies, in all of which it was certain that the first three lumbar ganglia had been removed bilaterally, 27 patients had no alteration in sexual function. Of eight subjects who had an extensive sympathectomy for hypertension (ninth thoracic to third lumbar at least), seven lost the power of ejaculation. Rose suggests therefore that the fibres with ejaculatory function arise from the region of the twelfth thoracic ganglion. He further postulates that they may finally run as an inner portion of the lateral root of the presacral nerve. As is well known, resection of the presacral nerve itself produces loss of ejaculation, presumably by involvement of these fibres at this level. Of the seven patients in the latter group with loss of ejaculation, three had retrograde ejaculation into the bladder.

This retrograde ejaculation after extensive sympathectomies has been noted by other observers. Hotchkiss, for example, reports several cases in which the sperms were isolated from the post-coital urine, and successfully used in artificial insemination. It implies that the epididymis, vas, vesicle and prostate can still function normally, but that it is easier for the semen to pass backwards into the bladder than to the exterior.

Also implied is that the motor supply to these organs is parasympathetic, as they have suffered sympathetic denervation. The sympathetic denervation probably prevents the tight closure of the internal vesical sphincter, and (possibly) the elevation of the verumontanum.

On general principles, considering the effect of the components of the autonomic system on other organs, one would expect the motor supply to the seminal vesicles to be parasympathetic. The classical experiments of Learmonth (1931), which are widely quoted (for example, Samson Wright), showed the contrary, but, as has been pointed out by Professor Mitchell, "stimulation of the hypogastric nerves or the superior hypogastric plexus is liable to involve both sympathetic and parasympathetic fibres". Professor Mitchell concludes that ejaculation is mediated through parasympathetic supply.

Gunn (1936), who pioneered the technique of artificial insemination in sheep, has detailed his researches from electrical stimulation, via a rectal electrode, of various segments of the spinal cord in the ram. He has made the following statement:

> It is considered that the nerves controlling the final expulsion of the ejaculum are from the sacral autonomic outflow, and that they are closely related to, but not identical with, those controlling erection.

He concludes that "the secretion of the accessory sex glands is controlled by the lumbar sympathetic outflow". The first part of the ejaculum is clear and represents stored prostatic secretion. This quantity can be greatly increased by a previous injection of a parasympatheticomimetic drug. The second part of the ejaculum contains the bulk of the sperms, the result of the previous contractions of the epididymis and vas. The last portion of the ejaculum is the secretion of the accessory sex glands.

Observation of an exposed testis showed contraction of the *vasa efferentia* and an increase in tension in the body of the testis itself. In rams, a double vasectomy did not affect the volume of ejaculate.

The volume of fluid from bilateral fistulæ of the *vas deferens* formed about one-tenth of the total ejaculate.

Semans and Langworthy (1938), in the male cat, showed that stimulation of the second sacral root produced complete erection and ejaculation. They also noted dilatation of the bladder neck on parasympathetic stimulation, but no effect from sympathetic stimulation. This may represent a species difference.

Talbot (1955) has made a most interesting report on the sexual functions of 408 paraplegics. In the interests of the rehabilitation of these patients, his conclusions deserve wider prominence. First, he found that there was no alteration in their psychic sexuality. Two-thirds of all subjects were capable of erection, of whom 20% could also obtain an erection from psychic stimulation only—that is, in 46% erection was purely reflex, whereas the other 20% had suffered an incomplete cord lesion. The closer the lesion was to the lumbo-sacral part of the cord, the greater was the frequency of impotence. Of the total 270 subjects retaining the function of erection, 94 had had the opportunity to have intercourse. In only 37 did ejaculation occur at orgasm; 53 stated that they obtained satisfaction. Of those patients capable of psychic erection, and therefore having incomplete cord lesions, over half ejaculated with intercourse, and 74% claimed satisfaction. Unfortunately Talbot does not discuss the question of retrograde ejaculation.

Discussion.

The accepted teaching that ejaculation depends on the integrity of one first lumbar ganglion is almost certainly incorrect. Likewise, that it is a function of the sympathetic system is also probably incorrect. Erection and ejaculation are most likely mediated via the parasympathetic sacral outflow. This is of importance to surgeons operating upon the autonomic system.

Clinically, patients with disorders of ejaculation are relatively common. The most common is premature ejaculation. This only rarely has an organic basis and will not be discussed further. Also fairly common is the complaint of absence of ejaculum, as a sequel to a transurethral resection of the prostate, due to obstruction of both ejaculatory ducts. In the vast majority of cases it is of no consequence, but should the patient desire paternity, then one can either create a genital duct fistula or reimplant the duct into the urethra. Neither procedure will be attended with great possibilities of success.

Retrograde ejaculation from neurological causes has been discussed. If children are desired, artificial insemination with the husband's sperms, isolated from the urine, should be attempted on many occasions.

Gunn found with rams' semen that urine contamination was highly lethal to sperms. Sperm longevity and motility were enormously decreased. The reaction of the urine was not so important as its concentration. Survival was longer in the specimens with a high mucus content.

A tight urethral stricture impedes the egress of semen also, and can act as a cause of sterility.

I have had one case of psychological lack of ejaculation.

The patient, a virile, healthy young man, aged twenty-six years, had been married for three years without issue, and thus presented himself at the Sterility Clinic of the Women's Hospital, Crown Street, Sydney. During the three years of marriage, he had indulged in coitus two to three times weekly, but had never ejaculated. He stated that he achieved a psychological orgasm. Prior to marriage he was normal in that respect, and since marriage he had had many nocturnal emissions. After further inquiry, he said that his wife was completely untutored in sexual matters when they were married, that she still regarded coitus with distaste, and that as soon as coitus commenced, he was exhorted to "get on with it, hurry up", *et cetera*. A consultation with the wife, and a graduated dose of alcohol to both parties to overcome the cortical inhibition produced a male heir.

There exists a smaller proportion of patients who lack ejaculation because of neurological lesions and yet do not have retrograde ejaculation. It occurred to me that these might respond to local electrical stimulation, the electrical stimulus either causing contraction of the smooth muscle of the seminal vesicle and prostate directly, and/or in recent cases also stimulating the distal nerve fibres and ganglia. Several patients were studied under thiopentone anæsthesia. The active electrode was introduced rectally and held against the posterior lobe of the prostate. The current was varied. In no case did erection or full ejaculation occur. Contractions of the *levator ani* were readily elicited, and also by radiation of current to the obturator nerves, adduction of the thighs. There was no extension of the hind limbs, alteration of respiration or heart rate, or any of the peripheral effects seen in rams with Gunn's apparatus. In one case, in which a panendoscope was placed in the posterior part of the urethra, rhythmic contractions of the bladder neck and urethra, in phase with the stimulus, were noted. A considerable quantity of prostatic secretion was expressed. Whether this was due to squeezing of the prostate by the levatores, or to contraction of the prostate itself, it was not possible to determine. In this case also the crura of the penis and the bulb contracted in phase with the stimulus.

It is thought that another apparatus which will deliver the correct stimulus (still to be determined) to the correct sites (also still to be determined) will be attended with success. Such an apparatus would be invaluable for research in this regard, and occasionally therapeutically. Experiments are being continued.

OBSTRUCTIVE PATHOLOGICAL CONDITIONS IN RELATION TO MALE FERTILITY.[1]

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THE male factor responsible in infertility has been variously stated as between 35% and 50% of infertile couples. It is still true to say that male infertility does not receive the attention it deserves. I should like to present some of the problems associated with obstruction to the excretory canal causing azoospermia in men with normal spermatogenesis.

Anatomical factors immediately obvious are the length of the excretory canal (Table I), its small diameter and, for the most part, its exposed position.

TABLE I.
Lengths of Vaso-epididymal Canal.
(*After* Bayle, 1952.)

Organs.	Metres.	Centimetres.
Vasa efferentia	—	10·0
Epididymal canal	7	—
Vas deferens	—	60·0
Ejaculatory duct	—	2·5
Anterior and posterior parts of the urethra	—	25·0

Total length: 7·975 metres.

Development.

The testis is developed from the germinal epithelium of the genital ridge situated medial to the mesonephros. Cellular cords develop which undergo transformation into the convoluted tubules of the testis, the straight tubules, and the *rete testis*. The *rete testis* becomes secondarily connected to the efferent ductules, which are derived from tubules of the mesonephros. The mesonephric (Wolffian) duct becomes the epididymis and *vas deferens*. The seminal vesicles are developed as evaginations of the mesonephric duct.

During the descent of the testis the epididymis, vas and testis change their relative positions. Vestigial remnants,

[1] Read at the annual meeting of the Urological Society of Australasia, Surfers' Paradise, April 16 to 19, 1956.

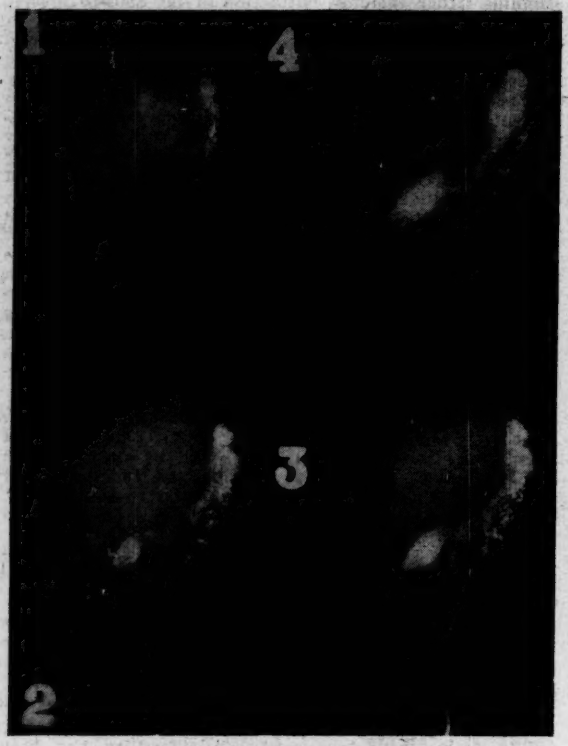

Figure I.

Figure II.

such as the paradidymis, appendix of the testis and appendix of the epididymis, are frequently the origin of cysts, but these rarely contain sperms. Epididymal cysts usually arise from the junctional area of the *vasa efferentia*.

The *vasa efferentia* in man have a single circular layer of plain muscle, and join in series to form the head of the epididymis. The epididymis is lined by a secretory, columnar epithelium and a plain muscle coat, the *vas deferens* by a columnar, non-ciliated epithelium and a powerful longitudinal muscle coat.

Diagnosis.

This discussion excludes patients with oligozoospermia or azoospermia due to deficient spermatogenesis.

A careful history must be taken, with special reference to congenital deformities, epididymo-orchitis or operation on the scrotum or inguinal canal. The greater part of the excretory canal may be examined clinically, endoscopically or radiologically. The testis in obstructive lesions is usually of normal size and consistency, although sometimes soon after acute epididymal obstruction it may be larger than normal, or after a severe lesion of the epididymis it may be small and atrophic.

Careful examination of the epididymis may at once reveal a localized or generalized thickening due to epididymitis. Cysts of the epididymis may be felt, although these are often so small as to be discovered only at operation. The vas is palpated to the external inguinal ring, and deficiencies or thickenings are noted.

Operation scars may at once localize the site of obstruction, and rectal examination should not be excluded.

Endoscopic examination of the posterior part of the urethra sometimes reveals abnormalities of the verumontanum, and the bladder neck can also be inspected.

Radiological Examination.

In 1913 Belfield first described the radiographic appearance of the *vas deferens* and seminal vesicles by means of injecting the vas at the neck of the scrotum with collargol. This was followed by Young and Walters (1920), and in 1939 Wilhelm described 121 vesiculograms taken by this route. Pereira (1953) in Sao Paulo has been an ardent advocate of vesiculography, and has described the radiographic findings in lesions of the seminal vesicles, prostate and bladder neck. Herbst and Merricks in 1939 described the visualization of the seminal tract by catheterization of the ejaculatory ducts.

Whereas vesiculography has long been recognized, vasoepididymography was introduced only recently by Boreau and his co-workers in France, and has been repeated with enthusiasm by other workers. Boreau established the safety of epididymography by examining sections of the resected epididymis afterwards, and he observed also that seminal specimens examined after this procedure were not affected.

It is at once clear that here is a method of examination of extreme value in pathological conditions of the male genital tract and in male sterility. Over the last twelve months the writer has carried out this examination on 10 patients, most of whom presented sterility problems. Before this procedure was undertaken, several examinations on post-mortem material were carried out. With 50% diodone solution the vas was injected towards the epididymis with varying quantities of dye, in order to ascertain the structural strength and capacity of the tubules (Figure I). Figure I represents the appearance after the injection of 0·3, 0·5, 0·7 and 1·0 cubic centimetre respectively. It was seen that 0·5 cubic centimetre of diodone flowed easily, without causing damage to the tubules, and was sufficient to give a good picture of the epididymis.

In Figure II the same procedure was adopted, but here we see a back flow occurring along the small vessels of the cord. This is important in relation to the tubular dilatation and rupture following obstruction.

Technique.—The dye is best introduced into the excretory canal by the direct approach to the *vas deferens* at the neck of the scrotum. The procedure is easily performed on out-patients, and after a pubic shave the patient is prepared in the X-ray room, provided there are facilities for full asepsis. The cord is infiltrated with 1% "Xylocaine" solution and the vas located through a small incision at the neck of the scrotum. The lumen is exposed by a very small longitudinal incision in the muscle coat of the vas. A blunt-ended needle can then be gently inserted into the canal in both directions. Boreau and Abeshouse introduce the hypodermic needle directly through the muscle coat. The dye used for injection is 50% diodone solution, and this is found to cause no irritation or crystallization. It is all absorbed within a few hours, and any accidental spilling in the tissues is without reaction. The epididymis is first injected with 0·3 cubic centimetre of dye and a film taken; then a further 0·2 cubic centimetre is injected if necessary. The proximal injection may be made at the same time, 1·5 to 2·0 cubic centimetres of dye being used. If a greater amount is used, the dye flows back through the posterior part of the urethra into the bladder and may obscure the vesicular outline. After the films have been taken, the skin is closed with one catgut suture, and there is no necessity to suture the vas. There has been no evidence of reaction following this procedure, and the patients are allowed to go home immediately afterwards. In three patients subsequently explored a patent vas at the site of epididymography was demonstrated.

Results.—Some of the results of this examination are shown in Figure III, in which can be seen the normal radiographic appearance of the ampulla of the vas, the seminal vesicles and the ejaculatory ducts. The dye is shown passing backwards into the bladder. Figure IV is an epididymogram showing puddling of the dye in the tail. This is similar to the appearance seen in inflammatory conditions of the epididymis, and at operation the tubules of the *globus major* were dilated. Other vasograms showed blockage of the *vas deferens*, and in one patient the appearance suggested a block at the ejaculatory duct (Figure V).

Cause of Obstructive Azoospermia.

Of 110 patients referred for investigation of infertility and examined by Dr. H. H. Pearson and the writer, 39 were found, after repeated semen analyses, to have azoospermia. Twenty-one of these patients were found to have an obstruction to the excretory canal, and one had retrograde ejaculation into the bladder. Five years previously this patient had undergone an endoscopic resection for Marion's disease. The analysis of these obstructions is shown in Table II.

Seven patients had a block in the *globus minor*, with no previous history of testicular swellings or inflammation. In two of these cases the block was confirmed by epididymography, which showed a puddling of dye in the epididymal tail similar to that appearing in inflammatory lesions (see Figure IV). Five patients were explored, and vaso-epididymostomy was performed on four. In these the tubules of the *globus major* were dilated, and in three of them non-motile sperms were isolated from the head. In the fourth case, actively motile spermatozoa were demonstrated in the head of the epididymis, and analysis of this patient's semen five months after operation showed that the count had risen to 240 million per cubic centimetre.

Five patients suffered from chronic epididymitis, in three cases post-Neisserian and in two non-specific in origin. Two patients on exploration had complete absence of the scrotal *vas deferens*. The establishment of a skin fistula was attempted in one of these by bringing the distal blind end of the vas to the scrotal skin. Spermatozoa were obtained in small numbers for two weeks, after which the fistula healed over. Two other patients were found on physical examination to have congenital absence of the vas. In one patient there were bilateral small cysts of the *globus major*. These cysts, containing many motile spermatozoa, were anastomosed to the vas. In one patient there was traumatic obstruction to the *vas deferens*, this structure being replaced by a thin cord of fibrous tissue; this followed inguinal herniorraphy in childhood. In one patient there was a congenital failure of continuity between the *rete testis* and *vasa efferentia* on one side and cysts of

FIGURE III.

FIGURE IV.

the *globus major* on the other; no spermatozoa were seen on either side. One patient with a very small ejaculate volume was seen to have a rudimentary verumontanum, and the ejaculatory ducts could not be demonstrated in the

vesiculogram (Figure V). In another patient a multicystic appearance was demonstrated at the verumontanum, and after light diathermy the patient wrote to say that his wife was pregnant. (We are a little doubtful of the validity of this report.)

These figures are small and somewhat incomplete, but it is interesting to compare them with findings of V. J. O'Conor (1953) in his study of 123 cases of obstructive azoospermia.

The Pathology of Duct Obstruction.

It was shown by Gunn (1936) in his experiments on the ram that epididymal sperms were non-motile, and that the fertilizing power of sperms from the head of the epididymis was not as good as that of sperms taken from the tail. He noted that during artificially induced ejaculation the epididymal tubules became smaller and the testicular tension increased. After repeated ejaculation the motility and fertilizing power of the spermatozoa diminished, and

FIGURE V.

the epididymis and vas were found to be emptied of sperms. This, and observations of other workers, seem to indicate that the epididymis has an effect on the maturation of spermatozoa.

In obstructions to the *globus minor*, dilated epididymal tubules are often seen full of spermatozoa, and if these are placed on a slide they are frequently actively motile. Although fertility may be reduced, they have produced pregnancy on numerous occasions. Simeone and Young (1931) and Simeone (1933) showed experimentally that a functional block to the epididymis could occur after sympathetic denervation, resulting in stagnation in the epididymal tubules instead of propulsion.

Obstruction to the male genital canal results in azoospermia, but spermatogenesis is not arrested. The proximal epididymal tubules are usually dilated behind the obstruction and their walls become attenuated. The lumen is packed with spermatozoa, hyaline material, desquamated epididymal epithelium and macrophages. Bayle (1952) has noted spermatozoa within these macrophages and suggests that this process also takes place outside the tubules after they have ruptured.

During the present investigation on autopsy material, it was noted that in one specimen the epididymis was distended and knotted and of a firm, rubbery consistency. Injection of the vas with diodone revealed a block in the tail of the epididymis, and when the *globus major* was incised thick yellow material poured out. A swabbing taken from this was sterile, and the histological examination of sections of this part of the epididymis revealed dilatation of the tubules with dense hyaline material and desquamated cells in the lumen (Figure VI).

Experimental studies on rats have shown that after occlusion of the branches of the epididymal arteries, there is swelling of the head of the epididymis and testes, the condition in the latter being easily misconstrued as

TABLE II.

Analysis of 21 Cases of Obstructive Azoospermia.

Obstructive Condition.	Number of Cases.
Epididymal occlusion without history of inflammation	7
Chronic epididymitis:	
Neisserian	3
Non-specific	2
Congenital absence of vas	4
Cyst of epididymis, junctional failure of *vasa efferentia*	1
Bilateral cysts of *globus major*	1
Traumatic deficiency in *vas deferens*	1
Probable occlusion of ejaculatory ducts	2

"orchitis". There is a fibrocytic response surrounding the efferent ductules which may resolve, the tubules being left patent and the testicle returning to normal size. More severe lesions with epididymal fibrosis caused congestive obstruction to begin with, followed by fibrosis and ultimate testicular atrophy.

TABLE III.

Analysis of 123 Cases of Obstructive Azoospermia.
(*After* O'Conor, 1953.)

Causative Condition.	Number of Cases.
Bilateral epididymitis (Neisserian or non-specific)	61
Deliberate ligation of vas (for sterility)	35
Previous vasotomy for collargol (Belfield's method)	8
Vas obstructed during operations for hernia *et cetera*	7
Bilateral failure of anatomical union between epididymis and vas	4
Bilateral congenital absence of vas	3
Congenital absence of epididymis	2
Unilateral atrophy of testis with congenital absence of epididymis and vas on the opposite side	2
Previous epididymectomy on one side with failure of union of epididymis and vas on the other	1

It would seem from these observations that sudden and severe high epididymal obstruction is liable to lead to testicular atrophy. With more distal obstructions there is a balance between spermatogenesis and spermatolysis, with dilatation of epididymal tubules and absorption of excess spermatic fluid. If the intraluminal pressure is too great the epididymal tubules will burst, with consequent further absorption of fluid or the formation of cystic spaces. Therefore, normal spermatogenesis will not be arrested.

Macmillan suggests that high congenital obstructions allow time for slow adjustment and therefore do not affect the normal spermatogenic pattern found on testicular biopsy.

Discussion.

It is seen that the great majority of men with obstructive sterility have lesions of both epididymes. This is reasonable when we consider the length of the canal (about 21 feet) and its small diameter. Inflammatory lesions, either post-gonococcal or non-specific, are the greatest hazards. In the records under study here, seven cases or one-third of the total were grouped as epididymal obstruction without previous history or physical signs of chronic

epididymitis. A number of these patients, no doubt, had acute epididymitis at some stage; but some may have had a congenital failure of junction of the vas and epididymis, or perhaps a functional block due to faulty innervation of the plain muscle of the epididymis. O'Conor records a high incidence of obstruction due to ligation of the vas for sterility, and reports a good prognosis after end-to-end anastomosis. There were seven cases of congenital abnormalities in the present series, as compared with only 12 in the larger series.

Hanley, in a recent Hunterian lecture, suggests that many more of these indeterminate obstructions may have a congenital basis, and he goes on to describe the possible congenital variations of the *vas deferens* and epididymis.

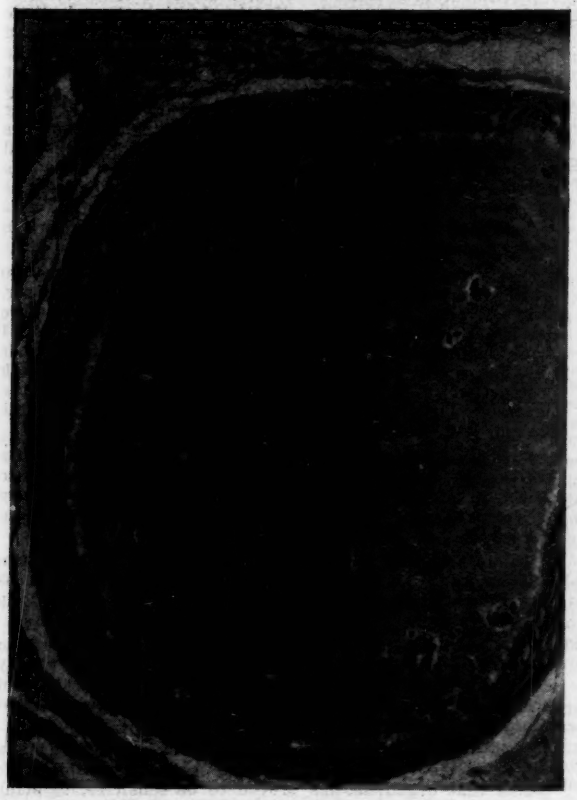

FIGURE VI.

Tuberculous epididymitis was not recorded as a cause of sterility; but with an increasing incidence of genito-urinary tuberculosis in this country it becomes an increasing hazard. Tuberculous vesiculitis alone does not affect ejaculate volume or sperm density; but Hanley points out that acute or chronic tuberculous epididymitis is often misdiagnosed, and stresses the importance of obtaining a specimen of ejaculate for culture.

Traumatic occlusion of the vas on both sides is not uncommon, and one wonders how often this may occur unilaterally. The occurrence of two cases of ejaculatory duct occlusion in such a small series is rather unbalanced, as these anomalies are quite uncommon. Small epididymal cysts are occasionally seen and often not apparent until operation.

Some aspects of the pathological changes in genital duct obstruction have been mentioned, and it is evident that there is a fruitful field for further experimental and clinical observation.

In practice we must continue to be optimistic and encourage our patients in what must seem a hopeless predicament. Diagnosis can often be made clinically and from the volume and quality of the ejaculate. Testicular biopsy is a valuable procedure when one is in doubt about spermatogenesis.

Vaso-epididymography may be performed simply and without morbidity and is of value in selected cases. It is not recommended as a routine examination.

Exploration of the scrotum with an attempt to reconstitute the seminal canal is recommended when possible. Vaso-vasal anastomosis carries quite a good prognosis, and vaso-epididymostomy is most favourable when there is a local epididymal block with motile spermatozoa in the head. In high obstructions to the head of the epididymis the fertilizing power of the sperms is probably diminished; but if spermatozoa are detected, an attempt should be made to bring about the desired pregnancy by artificial insemination, if necessary.

Due accent must be laid on prophylaxis in acquired obstructions to the genital tract, by the avoidance of damage to the vas and vessels of the cord during operations for maldescent of the testes, inguinal hernia, varicocele or hydrocele. Even minor epididymal inflammation in young people should be vigorously treated, and bed rest should be instituted to facilitate rapid resolution.

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CHRONIC PROSTATITIS.[1]

By John Somerset,
Melbourne.

I first became interested in the subject of prostatitis during the latter war years in the islands, when I began to see a considerable number of such patients. These were men in poor general health, suffering often from intercurrent diseases such as malaria and dysentery, and deficient in weight and on a diet grossly deficient in vitamins.

As you know, this condition may become chronic after an acute onset with or without urethritis, or more usually its onset may be insidious, and it is first seen as a subacute or chronic ailment without any history of an acute systemic infection. It may also be a late sequel of gonorrhœa or its treatment or complications. I propose to discuss these cases of silent or insidious onset and to ignore the acute phase of this condition if such a phase has occurred.

The syndrome with which patients have presented to me has been briefly as follows. In the first group which I mentioned, those of the servicemen on tropical service, I was impressed by the unanimity with which they returned from leave with the presenting symptom or complaint of depression or absence of virility during their annual twenty-eight days' leave. I am aware that this may well have been psychological; but among those patients who presented to me with this complaint, it was surprising how commonly the prostatic secretion was found to be loaded with pus cells. I would say that even nowadays the largest number of patients with this ailment whom I see give either a history of prolonged tropical service during the recent war or else a history that they were prisoners of war during that conflict. However, to revert to the syndrome of chronic non-specific prostatitis, I would divide it into several sections, as follows: (i) local symptoms, consisting of penile, perineal or perianal discomfort or irritation; (ii) low back pain; (iii) lassitude; (iv) the decrease or loss of virility which I have already mentioned, and often decrease in the quantity of ejaculate and/or discoloration of the semen; (v) finally, nervous depression—and it is this last last symptom or group of symptoms which can be so dangerous, as it easily tips over into a full-blown prostatic neurosis for which I know no real cure. Urinary symptoms are usually absent. There is no rise of temperature, and no general malaise, anorexia or other symptoms.

With regard to the physical signs, the urine is typically clear and contains numerous or only occasional threads. On general examination there are no physical signs that I know of, but the prostate itself may depart from the normal. It may be either soft and boggy or small and extremely firm, and all varieties between these two extremes may be met with. The gland may or may not be tender. If it is tender, pressure upon it often reproduces the penile discomfort of which the patient complains. It is my custom to massage the prostate while the patient holds a watch glass or petri dish under the external urethral meatus in order to collect the expressed secretion, which is then examined fresh under the microscope.

I do not regard the presence of occasional pus cells in this secretion as of any significance; but anything over about 10 or 12 pus cells per high-power field in a fresh unstained specimen examined under a cover slip, I regard as significant. Frequently, of course, the secretion will be found to be loaded with pus cells to the number of hundreds per high-power field. I use a rough count of the number of cells per high-power field as an index of the severity of the infection.

When I have decided that chronic prostatitis is present, it is my custom to have cultures prepared from both the urine and prostatic secretion, and any organisms that are grown tested for sensitivity. In the majority of cases no pathogenic organism is found, and it is my opinion that the infection in these cases is of a virus nature. However, in a large number of cases pathogenic organisms can be grown; frequently the same organism is grown from urine and prostatic secretion, but sometimes different or additional organisms may be grown from the prostatic secretion as opposed to the urine.

In cases in which pyogenic cocci are grown from the prostatic secretion, I think it is well worth while to make a search for possible septic foci. Although I am not a great believer in such foci, I have a number of cases in which the discovery and treatment of an apical dental abscess has led to the rapid resolution of a previously resistant coccal prostatitis.

At this stage Reiter's syndrome should perhaps be mentioned—that is, of course, the well-known triad of urethritis or prostatitis or both, associated with iritis or conjunctivitis, and/or polyarthritis. I think there is little doubt that this is a virus infection. It is always stated to be non-venereal; but in this connexion I have had one patient who developed his symptoms some ten days after one act of extramarital intercourse. The condition slowly subsided over a period of about two years—that is, after several recurrences—and he was then free from symptoms for six years. He then consulted me again with the typical symptoms of this condition, once more a week after one act of extramarital intercourse with the same partner as on the previous occasion. I have always thought this case slightly suspect with regard to the non-venereal origin of the condition.

I regard prostatitis as an important ailment, not so much because of its immediate symptoms, which are minor, although annoying and irritating to the patient, but more particularly on account of its course or complications. I firmly believe that non-specific prostatitis is the forerunner of the small fibrous prostate producing bladder-neck obstruction in middle age or later life, simply from the normal progress of chronic inflammatory change towards fibrosis and contraction.

It is also my opinion that blockage of prostatic ducts and glands may well lead to, and in fact be, the cause of the development of the prostatic calculi which we see so often in association with microscopic chronic inflammatory change in the gland.

The obstinate or unresponsive case may well be unresponsive owing to the development of multiple small abscess cavities throughout the gland, which alternatively fill up and discharge.

The only special investigations that I have found to be of any real help are urethrography, the plain X-ray examination to demonstrate the presence or absence of prostatic calculi, and panendoscopy, which I think is at times helpful.

Treatment of the condition is disappointing. It is usually easy, by the exhibition of the appropriate antibiotic to which that organism has proved to be sensitive, to bring about a symptomatic cure in a case in which pathogenic organisms can be grown from the prostatic secretion. However, in the majority of cases in which no such pathogen can be grown, antibiotics are disappointing. I would except possibly "Chloromycetin", with which I have often had considerable symptomatic improvement, even when no definite organism has been grown on culture. Should sulphonamides or antibiotics prove disappointing, one is then forced back to the old regime of regular prostatic massage and stripping of the seminal vesicles, and in my experience it is usually possible to obtain a symptomatic cure and to render the prostatic secretion relatively free from pus cells, although I must say that it is seldom that it becomes entirely free from pus cells.

Consequently I have found that there is a definite tendency towards recurrence or flare-up of the condition, and the course of massage may have to be repeated at intervals over a considerable period. I think that it is a great mistake to persist with such treatment for too long a time, or indeed for longer than is necessary to produce symptomatic relief—this on account of the tendency for the patient to develop a neurotic fixation on his prostate and genitalia generally. I have found little or no help

[1] Read at the annual meeting of the Urological Society of Australasia, Surfers' Paradise, April 16 to 19, 1956.

from the passage of sounds or the use of diathermy through the panendoscope; but in those cases in which the condition has gone on to abscess formation—either a single large abscess cavity or multiple small ones—or to the formation of multiple prostatic calculi, I believe it is useless to hope for cure by conservative measures, and in these cases operation must be considered.

The type of operation to be employed is arguable. In my experience, transurethral resection of such glands gives moderately good results. I feel that the case would need to be extreme to justify such measures as radical prostatovesiculectomy, which can still be performed later if necessary. After either conservative or surgical treatment, I think that it is extremely important to instruct the patient to try to maintain his general health at as high a level as possible, with an adequate diet, vitamin intake *et cetera*, an adequate amount of rest and holidays, and the avoidance, so far as possible, of intercurrent disease. In my experience, such episodes as an attack of influenza may well be sufficient to produce a recurrence of the prostatitis.

Finally, I think that the effect of this condition upon fertility should be mentioned. I have had several patients who presented for inquiry into childless marriages, and the treatment of gross prostatitis with reasonable success has been followed by pregnancy of the female partner of the marriage.

CLINICAL EXPERIENCE WITH "FURADANTIN".[1]

By COLIN EDWARDS,
Sydney.

ONE of the most troublesome of current problems in urological practice is the management of urinary infections due to organisms which are resistant to sulphonamides and antibiotics. Therefore when the opportunity to make a brief clinical trial with "Furadantin" was presented through the courtesy of the manufacturers,[2] it was gladly accepted. As this drug has not been freely available in Australia, although it has been used extensively abroad, it was thought that a résumé of this experience might be of interest to you.

The makers claim that "Furadantin" is prepared specially for use in urinary tract infections; that it is efficacious for many strains of bacteria which are resistant to sulphonamides and antibiotics; and that complications due to the drug are lower in incidence and less serious in type than when antibiotics are administered.

"Furadantin" is the trade name for nitrofurantoin, one of the antibacterial nitrofurans. It is a stable, yellow crystalline compound, 45% of which is excreted in the urine after oral administration. This high degree of solubility obviates any danger of crystallization, but the brown catabolic end-products may colour the urine. It is noteworthy that this drug is bactericidal, not bacteriostatic, and there is some evidence that resistant mutants develop less readily than is the case with antibiotics (Waisbren and Crowley, 1955). In the records available there does not appear to be any instance of acquired drug resistance, but there was no opportunity to test this feature in the present series.

The dosage recommended is five to eight milligrammes per kilogram of body weight per day, and 10 milligrammes should not be exceeded. For the average adult this usually works out at eight tablets of 50 milligrammes each. The tablets are scored to facilitate smaller dosage. It is suggested that if no improvement takes place by the third day of administration, "Furadantin" therapy should be discontinued.

The only side reactions observed in this group were nausea and vomiting. The former may be diminished to a tolerable degree by insisting that food or milk be taken simultaneously or by temporary reduction in dosage. Vomiting requires temporary cessation and subsequent reduction in dosage, but it may make treatment with this drug impracticable. One patient in this group had to abandon "Furadantin".

Other complications reported include skin sensitivity, diarrhœa, headache and malaise. However, some complications which are relatively common with antibiotic therapy are fortunately absent. Stomatitis, colitis, proctitis and pruritus do not occur.

Although there are no reports of renal or hepatic toxicity, it is advisable to use minimal doses under close observation in cases of advanced renal failure, as the drug may not be excreted.

Owing to the strict limitation of supplies it was decided to select cases in which sulphonamides and antibiotics were ineffective. Generally these patients had intractable (but not necessarily chronic) urinary infections and had had a clinical trial with a sulphonamide; there had been a negative response *in vitro* to available antibiotics, one of which had been used without effect. Disks are prepared for testing the sensitivity of organisms bacteriologically; but unfortunately they were not available, and this very helpful guide in the selection of suitable cases was lacking. Only 23 patients could be treated, and in some instances "Furadantin" administration might well be considered inadequate, as it was suspended forty-eight hours after the main symptoms had abated.

Frequently two or more varieties of bacteria were isolated in an individual case, but the incidence of the resistant strains was as follows:

Proteus vulgaris	14 cases
Staphylococcus aureus hæmolyticus	8 cases
Aerobacter aerogenes	1 case
Staphylococcus albus	1 case
Bacterium coli group	1 case

The diseases represented were as follows:

Urethritis and urethro-vaginitis	2 cases
Urethral stricture	2 cases
Prostatic abscess	1 case
Enlarged prostate (including fibrosis)	9 cases
Vesical calculus	1 case
Ureteric calculus	2 cases
Renal calculus	5 cases
Acute pyelonephritis	1 case

The results of treatment were as follows.

In 12 cases the urine was rendered sterile and so remained, sometimes after repeated courses. In addition three cases terminated with the urine microscopically free of organisms; in these culture was not practicable. The original infection persisted in eight cases. Three of these patients, for various reasons, had inadequate surgical drainage, and one was unable to complete the proposed course of treatment. Probably some, if not all, have not had sufficient "Furadantin".

Without exception, in every case there was some degree of clinical improvement during the administration. In two instances in which "Gantrisin" had previously proved ineffective, it was observed after the "Furadantin" had relieved the main symptoms that the infection was apparently controlled, although not eliminated, by "Gantrisin". This suggests the possibility of attenuation of the organism; but it may be accounted for by improved general health and increased individual resistance. This sequence of treatment was not attempted early in the series.

Finally, it should be mentioned that, apart from one patient who abandoned "Furadantin" because of vomiting, no patient suffered any ill effects which could be attributed to the drug.

The clinical details of the series are set out in Table I.

Conclusion.

With such a limited scope for trial, it is obvious that any conclusions can be only tentative. However, it is apparent that some bacteria which are resistant to sulphonamides and antibiotics do in fact respond favourably to the administration of "Furadantin". Further, no patient suffered any reverse attributable to this drug, whereas

[1] Read at the annual meeting of the Urological Society of Australasia, Surfers' Paradise, April 16 to 19, 1956.

[2] Eaton Laboratories, Norwich, New York.

TABLE I.
Clinical Details in 23 Cases.[1]

Case Number.	Sex.	Age. (Years.)	Diagnosis.	Operation and Complications.	Organism.	Result.
1	M.	72	Prostatic hypertrophy; renal calculus.	Prostatectomy; cystitis and pyelonephritis.	*Proteus vulgaris.*	Relieved, relapsed; relieved, persists.
2	F.	8	Urethritis.	Urethral dilatation and fulguration; enuresis.	*P. vulgaris, Staphylococcus aureus.*	Cured; urine sterile.
3	M.	52	Prostatic hypertrophy; prostatitis.	Prostatectomy; spinal injury with paresis of lower limbs (30 years); scrotal abscess.	*P. vulgaris.*	Relieved; infection persists.
4	F.	47	Infected calculus; hydronephrosis.	Pyelolithotomy and plastic procedure; nephrectomy later.	*P. vulgaris, Bacterium coli.*	Sterile contents of hydronephrosis at nephrectomy.
5	M.	36	Dendritic renal calculus.	Solitary kidney; pyelonephrolithotomy.	*S. aureus, B. coli.*	Sterile urine (15 months).
6	F.	11	Cysto-urethritis.	Urethral dilatation and fulguration; enuresis.	*P. vulgaris, B. coli.*	Cured; urine sterile.
7	M.	57	Bilateral renal calculi.	Left pyelolithotomy; sinus and wound infection.	*S. aureus hæmolyticus* (urea-splitter).	Relieved; infection persists.
8	M.	36	Ureteric calculus; pelvic abscess with sinus.	Previous operation failed; ureterolithotomy.	*Aerobacter aerogenes, B. coli.*	Cured; urine sterile.
9	M.	80	Prostatic hypertrophy.	Transurethral resection; bilateral epididymitis.	*S. aureus hæmolyticus.*	Urine microscopically clear.
10	M.	68	Prostatic hypertrophy; vesical calculus.	Prostatectomy and lithotomy.	*P. vulgaris.*	Urine sterile.
11	M.	82	Prostatic hypertrophy; vesical calculus; infected hydronephrosis.	Prostatectomy; lithotomy; secondary hæmorrhage.	*P. vulgaris, S. albus, B. coli.*	Relieved; relapsed. Urine sterile.
12	M.	33	Renal calculus; urethral stricture; hypospadias.	Internal urethrotomy; pyelolithotomy later.	*P. vulgaris* (urea-splitter).	Ultimate sterility of urine (three courses).
13	F.	47	Multiple bilateral renal calculi.	Left pyelonephrolithotomy; right calycectomy later.	*P. vulgaris.*	Relieved; resistant.
14	M.	46	Traumatic stricture; prostato-membranous urethra.	Excision of stricture; urethritis; epididymitis.	*S. aureus hæmolyticus*; streptococcus; *B. coli.*	Urine microscopically clear.
15	M.	72	Prostatic hypertrophy prostatitis; epididymitis.	Two-stage prostatectomy and vas section.	*P. vulgaris.*	Urine microscopically clear.
16	M.	68	Prostatic hypertrophy (cysto-colic fistula).	Prostatectomy; boils.	*S. aureus hæmolyticus.*	Infection persists with vesical symptoms.
17	F.	42	Hydronephrosis; nephroptosis; uretero-pelvic junction obstruction (bilateral).	Plastic procedure and right nephropexy; left nephrectomy later.	*P. vulgaris.*	Urine sterile.
18	F.	56	Vesical calculus.	Suprapubic lithotomy; pyelonephritis and renal failure.	*P. vulgaris.*	Recovered; infected
19	M.	26	Ureteric calculus.	Cystoscopic manipulation; pyelonephritis.	*B. coli.*	Urine sterile.
20	M.	60	Urethral stricture; prostatic abscess.	Transurethral resection (perineal, for drainage); continuous dilatation.	*P. vulgaris.*	Infection persists
21	M.	52	Acute bilateral pyelonephritis.	Carbuncle.	*S. aureus hæmolyticus.*	Urine sterile.
22	M.	65	Prostatic fibrosis and hypertrophy.	Transurethral resection.	*P. vulgaris.*	Urine sterile.
23	M.	78	Prostatic hypertrophy; cardiac asthma.	Two-stage prostatectomy.	*S. aureus.*	Infection persists.

[1] Summary: urine sterile, 12 cases; urine microscopically clear, three cases; urine still infected, eight cases.

some degree of clinical improvement was noted in each one, in the absence of any other systemic medication. Several patients had dramatic relief. It seems, therefore, that "Furadantin" is a potent and relatively innocuous drug for use in selected cases of urinary infection.

The prolonged absence of this substance from the Australian market is most regrettable. Not only does it cope with some organisms which hitherto have proved intractable, but without doubt its use would diminish very substantially the present extensive use of antibiotics without the risk of dangerous complications.

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WAISBREN, B. A., and CROWLEY, W. (1955), "Nitrofurantoin: Clinical and Laboratory Evaluation", *Arch. Int. Med.*, 95: 653.

NEPHROCALCINOSIS.[1]

By VICTOR SAMPSON,
Brisbane.

DEPOSITION of calcium in the renal parenchyma is not uncommon and can be demonstrated histologically in up to 25% and radiologically in some 10% of autopsy specimens of apparently normal kidneys.

[1] Read at the annual meeting of the Urological Society of Australasia, Surfers' Paradise, April 16 to 19, 1956.

The first reference to calcium deposition was by Virchow in 1855, but the term "nephrocalcinosis" was first used by Albright and others in 1934 to indicate the radiological manifestations of calcium deposition in the kidney substance of patients with primary hyperparathyroidism. Since then there seems to have been originally some tendency to restrict the term "nephrocalcinosis" to such examples of diffuse renal parenchymal calcification as are radiologically demonstrable; but in recent years the sense of the term has been widened to include also those cases in which the calcification, not necessarily radiologically apparent during life, has been demonstrable macroscopically or microscopically in the autopsy specimen. After all, though the actual mechanism of calcium deposition may vary, it is reasonable to suppose that it is the severity or duration of the causal condition that determines whether the deposition is macroscopic or microscopic in character.

In considering the causes of nephrocalcinosis it is necessary to have some idea of calcium metabolism. The chief dietary source of calcium is dairy produce—milk, cheese and eggs—with sea foods a bad second. Dietary calcium is incompletely absorbed from the small intestine; the principal moderating influences, as far as we are concerned, are vitamin *D*, which facilitates absorption, and cortisone, which antagonizes the action of vitamin *D*. Calcium exists in the blood in diffusible and indiffusible (that is, protein-bound) forms; it is the diffusible moiety which is physiologically important. Calcium is deposited as bone under the influence of the osteoblasts which form the protein matrix of the osteoid precursor of bone and produce alkaline phosphatase, whose action on organic phosphates

of the blood results in a local excess of phosphate ions and precipitation of calcium as phosphate about the matrix. The level of serum alkaline phosphatase is the indicator of the degree of osteoblastic activity. Here it is interesting to note that the kidney is one of the tissues with highest alkaline phosphatase content, the phosphatase here being concerned primarily with the tubular reabsorption of glucose.

A rise of pH decreases the solubility of calcium, and in metastatic calcification the deposition occurs chiefly in those tissues (distal renal tubules, gastric mucosa and pulmonary alveoli) which excrete acid; in consequence of this excretion a locally increased alkalinity might be expected. The same explanation is sometimes given for dystrophic calcification; the calcification occurs in tissues which are metabolically inactive and are producing less carbon dioxide than usual. Conversely, a fall in pH causes removal of calcium from bone. Calcium mobilization also occurs under the influence of parathormone, which has an action directly on bone, that is, on some aspect of osteoblastic activity, or on the physical state of the bone matrix, as well as on the renal tubule. The fall of serum calcium level after parathyroidectomy can be correlated with pre-operative alkaline phosphatase level.

The non-protein-bound serum calcium is filtered by the glomeruli (eight or nine grammes per day). Only 200 milligrammes or so are excreted in the urine; the remainder is reabsorbed by the tubules. Factors which decrease this reabsorption are, among others, vitamin *D*, thyroxin and systemic acidosis. The acidity and volume of the urine are the chief factors keeping the urinary calcium in solution.

Many of the details of calcium metabolism are obscure, but the outline given will serve as a basis for the discussion of hypercalcinuria and hypercalcæmia.

Hypercalcinuria may occur with or without hypercalcæmia. In the osteoporosis which accompanies bodily immobilization, for example, the extent of the discrepancy between bone destruction and bone formation determines whether hypercalcinuria occurs alone or both hypercalcæmia and hypercalcinuria occur. It is easy enough to blame defective tubular reabsorption of calcium for the "idiopathic" hypercalcinuria described by Flocks; but with a total daily filtration of nine grammes of calcium and a normal excretion of, say, 200 milligrammes, a defect in reabsorptive capacity of only 2% would suffice to double calcium excretion. Moreover, the fact that hypercalcæmia ever occurs indicates that the tubules are such willing horses that it is difficult to persuade them ever to reabsorb less than 95% of the calcium in the glomerular filtrate. As far as calcium is concerned, their function is conservation, as it is with sodium.

The principal condition of hypercalcinuria without hypercalcæmia in which nephrocalcinosis occurs is the so-called renal tubular acidosis. This depends on the incapacity of the kidneys to secrete urine of the normal degree of acidity. Normally this is achieved by the following actions: (i) conversion of Na_2HPO_4 to NaH_2PO_4; (ii) excretion of organic acids; (iii) formation of ammonia, which indirectly replaces fixed base reabsorbed from the tubule. Each of these processes involves the replacement of reabsorbed sodium ions by hydrogen ions derived from carbonic acid formed in the tubular cell from carbon dioxide and water under the influence of the enzyme carbonic anhydrase. If H^+ ions are not available, their place is taken by other cations, Na^+, K^+ and possibly Ca^{++}. The systemic acidosis mobilizes calcium, which appears in excess in a tubular fluid of decreased acidity, conditions very favourable for calcium deposition. The defect is thought to reside in the carbonic anhydrase, for a similar metabolic state can be produced in animals and in infants by the administration of "Diamox" (a sulphonamide and carbonic anhydrase inhibitor), and in the past other sulphonamides have been thought to be causally associated with nephrocalcinosis (Engel).

The defect in renal tubular acidosis is apparently inborn; the symptoms are often first manifest in infancy (as failure to thrive), and with treatment remit; but they may be delayed until adolescence or adult life, when the patient presents with osteomalacia, with muscular weakness (hypokalæmia) or with renal symptoms.

A similar defect in base conservation (or urine acidification) may be acquired as in chronic pyelonephritis or, possibly, chronic glomerulonephritis. It is well known, for example, that many chronic pyelonephritic kidneys show defective capacity to form ammonia, and often in chronic pyelonephritis failure of one aspect of tubular function has become apparent long before, or has preponderated over failure of others, with such syndromes as salt-losing nephritis, potassium-losing nephritis or water-losing nephritis as the result. It is possible, therefore, that renal tubular acidosis contributes to the likelihood of nephrocalcinosis in chronic pyelonephritis; but additional factors are the alkaline urine produced by infection, and the presence of foci of necrosis in papillæ and parenchyma.

Here, while acidosis and chronic pyelonephritis are under discussion, and before we come to primary hyperparathyroidism, is probably the place to introduce the subject of secondary hyperparathyroidism. In children and young adults with a long history of renal insufficiency (due to renal hypoplasia, malformations of the urinary tract including polycystic kidneys, or to pyelonephritis or nephritis) there are retention of phosphate, a reciprocal fall in serum calcium level, and compensatory parathyroid hyperplasia. This and the acidosis combine to remove calcium from the bones; the bony changes which occur (renal *osteitis fibrosa* or renal osteodystrophy) are essentially those of primary hyperparathyroidism, and as in primary hyperparathyroidism, nephrocalcinosis may occur, but not necessarily by the same mechanism. Calcification in tissues other than the kidney is common in these cases.

We may now consider hypercalcæmia. Primary hyperparathyroidism is the cause *par excellence* of hypercalcæmia and of nephrocalcinosis. Excess parathormone results in removal of calcium from bones; however, bone disease will result, according to Albright, only if the calcium intake fails to keep pace with excretion. Hyperparathyroidism without bone disease is thus not uncommon; in these cases the serum alkaline phosphatase content is normal. When hyperparathyroidism is suspected, any serum calcium estimation should be checked by estimation of serum proteins and reference to nomograms from which the concentration of ionized calcium may be derived. Other conditions involving destruction of bone may cause hypercalcæmia and nephrocalcinosis; but in these the serum phosphorus content is usually normal or high (compare hyperparathyroidism). These are, among others, osteolytic metastases, myelomatosis (in which a true hypercalcæmia with hypercalcinuria may occur) and sarcoidosis, the renal complications of which are due to nephrocalcinosis rather than to sarcoid lesions within the kidneys. Recently Dent and others have produced evidence that the hypercalcæmia of sarcoidosis is due to excessive intestinal absorption. The action of the œstrogens and androgens used in the treatment of carcinomatosis is unpredictable in many ways, and they are sometimes found to aggravate the osteolytic process and thereby precipitate hypercalcæmia and nephrocalcinosis.

Next in the causes of hypercalcæmia, and sometimes of nephrocalcinosis, is excessive intake of calcium, often combined with the ingestion of large amounts of absorbable alkali in the so-called milk drinker's syndrome; the biochemical features of this are hypercalcæmia without hypercalcinuria, with a normal or high serum phosphorus level and a moderate alkalosis, conditions very favourable for the metastatic calcification which occurs in the kidney and in other tissues. Excessive intake of cow's milk, which contains four to five times as much calcium as human milk, and alkali (milk of magnesia, alkaline carminatives) has been suggested as the cause of "idiopathic" hypercalcæmia of infants, another condition in which nephrocalcinosis may occur. An alternative explanation for this syndrome is excessive intake of, or increased sensitivity to, vitamin *D*. A mild recoverable and a severe irrecoverable form of this syndrome are described.

While we are on the subject of ingestion of milk and alkali, it is well known that in conditions of alkalosis renal function may be temporarily or at times permanently impaired. The cause of this is thought not to be the alkalosis *per se*, but first the renal circulatory changes and ischæmic lesions accompanying the dehydration associated with the alkalosis, and secondly (when the patient has been on a milk diet, which is often the case) an associated hypercalcæmia, which, harmful in itself, is more so when associated with alkalosis, which increases the likelihood of deposition of calcium and renal damage thereby. Patients who die of pyloric obstruction often have microscopically evident nephrocalcinosis, and foci of calcification are twice or three times as common in the kidneys of ulcer patients as in those of non-ulcer patients.

Finally there is the possibility that in any one patient two or more of the factors mentioned may be operative; for example, a patient with chronic pyelonephritis may take alkalis for his indigestion.

The clinical picture of nephrocalcinosis is rather non-specific—azotæmia, polyuria and isosthenuria, with little or no albumin, red cells or casts in the urine. Hypertension and retinopathy are usually absent.

THE TREATMENT OF ACUTE RENAL FAILURE WITH THE ARTIFICIAL KIDNEY.[1]

By Keith Kirkland,
Sydney.

Acute renal failure may be defined as rapid deterioration of function due to abnormality of and damage to nephrons, particularly to the tubular epithelium. Recent observations by Oliver and co-workers in 1951 (Merrill, 1955) suggest strongly that the term "lower nephron nephrosis" is not truly descriptive of the lesion, and that acute tubular necrosis is preferable.

Oliguria and anuria are symptoms of this syndrome, but also occur as transient phenomena in renal decompensation due to disorders of circulation, dehydration and electrolyte deficits, which result in no tubular necrosis or anatomical alteration. A distinction must be made, yet it should be realized that if the duration of decompensation is sufficient, tubular necrosis may result.

The majority of cases occur after surgical or obstetrical procedures, and are due to a phase of hypotension, often unrecognized, with altered renal hæmodynamics. The ætiological factors may, however, be obscure; two cases in my own practice followed prostatectomy in fit patients, and the operation did not appear to be associated with shock, collapse or undue blood loss. In 225 cases of acute renal failure, Merrill could make no specific ætiological diagnosis in 25%. Oliver described two types of lesion, and distinguished between the effects of nephrotoxic agents on the one hand and the result of ischæmia and anoxia on the other. In the former, necrosis of the epithelial cells occurs in the proximal part of the tubule, while the latter factors cause disruption of the basement membrane in addition. This results in a leakage of tubular contents to cause local œdema, possibly relating to anuria. However, the pathological basis may be mixed, and may occur in varying degree in the nephrons and be distributed quite irregularly. Importantly, from the clinical point of view, much of the damage is reparable, and as acute tubular necrosis is self-healing, therapy in the oliguric or anuric phase should aim "to maintain the internal environment in a state which is as near normal as possible and to prevent complications or treat such as may arise". (Welt, 1955.)

Treatment.

Some principles in the management of a case of acute renal failure are vital. At the outset, surgical factors such as post-renal obstruction must be eliminated. Dehydration must be recognized, but fluid administration should be limited to basal requirements and over-hydration avoided. Repeated accurate weighing constitutes a useful check in this regard. Circulatory insufficiency resulting in hypovolæmia should be avoided. The catabolism of cellular protein becomes significant in the anuric patient; the residue cannot be excreted, and accumulation of acid metabolites occurs, with acidosis, hypocalcæmia and hyperkalæmia. The intravenous administration of protein-sparing calories in the form of 50% glucose solution in water retards this development. Delivery of this strength of glucose should be central and not peripheral. Maintenance of a normal electrolyte balance may be difficult, in that vomiting, hæmorrhage and infection so affect the pattern as to make very frequent observations and adjustments necessary. Potassium tends to increase in the extracellular fluid, particularly with acidosis, while sodium and chloride losses create further imbalances. Anæmia commonly occurs and may require correction, while vitamin deficiency should be avoided. Treatment in acute renal failure cannot be formularized, but must be freely adjusted to individual demands, and although many patients may be saved by conservative management, radical measures are often necessary.

Elimination and detoxication may be aided by more positive therapy. Replacement transfusions, the use of carboxylic cation exchange resins, particularly in the face of potassium intoxication, and internal dialysis by bowel or peritoneum are all valuable under circumstances that need not be defined here. When, then, should external dialysis by the use of an artificial kidney be carried out? No clear-cut answer can be given. It is not possible to forecast diuresis and the return of kidney function, and it is equally impossible to anticipate sudden deterioration, collapse and death. Obviously, when all else has been tried and the patient is *in extremis*, there is no practical alternative. Such circumstances hardly provide a reason for the use of such exact and controllable therapy. Abel, Rountree and Turner (Merrill, 1955) described an artificial kidney in 1913, and in the first published article wrote as follows:

> There are numerous toxic states in which eliminating organs of the body, more especially the kidneys are incapable of removing from the body, at an adequate rate the natural or unnatural substances whose accumulation is detrimental to life. In the hope of providing a substitute in such emergencies, which might tide over a dangerous crisis as well as the important information it might be expected to provide, concerning substances normally present in the blood and also for the light that might be thrown on intermediary stages of metabolism, a method has been devised by which the blood of a living animal may be submitted to dialysis outside of the body and again returned to the natural circulation without exposure to air, infection by micro-organisms or any alteration which would necessarily be prejudicial to life.

In acute renal failure or acute tubular necrosis, all forms of treatment, whether supportive or detoxicating, conservative or radical, should be available and regarded as complementary. I believe it better to resort to external dialysis often and early rather than rarely and late. For some days prior to and even after the onset of diuresis the patient is listless, dull and non-cooperative, rendering nursing and medical attention difficult and tedious. The dramatic improvement and general sense of well-being after dialysis are in marked contrast. I cannot do better than quote Merrill, who has summed up an experience in use of the artificial kidney on more than 500 occasions as follows:

> Dialysis in the treatment of acute renal failure must be thought of as an adjunct to rather than a substitute for good conservative measures of management. There is no question that the previously healthy individual with acute reversible renal failure uncomplicated by infection or trauma may survive two or even three weeks of oliguria with nothing but conservative measures. There is no question either that the last week or ten days of his course will be difficult and uncomfortable. Under such circumstances the relief of nausea and vomiting and the increased alertness and sense of well being that may be accomplished with the use of the artificial kidney facilitate the application of other methods of treatment. Here the use of the artificial kidney is not "necessary" to survival but makes the clinical course more benign.

[1] Read at the annual meeting of the Urological Society of Australasia, Surfers' Paradise, April 16 to 19, 1956.

In general, all types of artificial kidney operate on the same principle. Arterial blood from the patient flows or is pumped through "Cellophane" tubing or between sheets of "Cellophane". This membrane separates the flowing blood from the adjustable electrolyte solution which constitutes the bath or rinsing fluid. By circulation of the blood under these conditions for some hours, and by changing or refreshing of the rinsing solution, transfer of metabolites and crystalloids across the membrane achieves a differential diffusion or dialysis. In some respects the membrane subserves the function of the glomerulus, as it is impermeable to colloidal solutes, and so serum protein and blood cells are not lost. As in theory non-dialysable toxins may be removed by replacement transfusions, the advantage of combined therapy is apparent. Coagulation of the blood is prevented by adequate use of heparin, and this constitutes a contraindication to the use of the artificial kidney immediately after operation.

The machine at Sydney Hospital is that designed by Alwall, of Lund, Sweden. The blood circulates in a "Cellophane" tube twenty to twenty-four metres long, which presents a surface area of about 15,000 square centimetres. The tubing is wound round a cylinder; this is encased in a second cylinder, which restricts the "Cellophane" tubing to a flat band containing a thin layer of blood only. This apparatus is completely immersed in the electrolyte solution, which is stirred by a small motor-driven propeller. A treatment lasts for about eight hours. The dialysing apparatus may be used as an ultrafilter, in which case pressure on the outside of the "Cellophane" tube is lowered by means of a suction pump, and this is stated to have an important bearing on the use of the kidney in cases of œdema with retention of fluid and electrolytes.

Obviously the last word has not been written about the therapeutic indications for external dialysis or about the apparatus to be used. Many lives have undoubtedly been saved by the use of the artificial kidney, and recovery of many other patients in acute renal failure has been simplified. I believe that each large city of the Commonwealth should have a renal unit or kidney clinic as part of, or at least in close association with, the department of clinical research. This clinic should possess all equipment required for the treatment of acute renal failure, which must of necessity include an artificial kidney. So much remains to be discovered in the management of all kidney disease that therapy and research are almost synonymous terms.

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Reports of Cases.

EXPERIENCES WITH THE ARTIFICIAL KIDNEY.[1]

By J. C. A. Dique,
Brisbane Hospital, Brisbane.

In the treatment of acute renal insufficiency it is possible to maintain life for prolonged periods by adhering rigidly to the following principles: (i) limitation of fluid intake to the amount lost daily by all routes; (ii) replacement of only such electrolytes as are lost daily by all routes; (iii) administration of a diet of high Calorie content with no protein, in order to reduce endogenous metabolism to a minimum (Bull and Borst diets); (iv) administration of antibiotics in full doses, because sepsis carries a high mortality; (v) limitation of activity in order to lower basal metabolic rate.

Although conservative treatment has undoubtedly saved many lives, it is nevertheless impossible to treat all patients with anuria by this means. Sepsis, hyperkalæmia, old age or an excessively prolonged period of anuria, tends to limit life. Therefore in those cases in which conservative treatment is judged to have failed or to be inadequate, active measures should be taken to reduce to a more normal level the waste products of metabolism which have been allowed to accumulate under conservative management.

Peritoneal lavage, gastric lavage, the use of ion exchange resins, exchange transfusions, intestinal lavage and hæmodialysis have all been tried by various workers. Only hæmodialysis will be considered here.

In 1955 a detailed account was given of the first artificial kidney built in Australia, with the clinical history of a patient who was successfully treated by this machine (Dique, 1955).

The following is a short account of two other cases in which it has been used.

Case I.

Mrs. O. was a woman of average build, who was admitted on January 19, 1956, to the Brisbane Hospital under the care of Dr. Roy Hemsley, with symptoms suggestive of an incomplete miscarriage. Her blood pressure was 115 millimetres of mercury, systolic, and 70 millimetres, diastolic; the pulse rate was 70 per minute and the hæmoglobin value was 77% (11·6 grammes *per centum*). On January 20 she managed to expel the fœtus, but the placenta was not passed. At about 6 o'clock that evening the placenta was removed manually, and this procedure was followed by gentle curettage. At 10 o'clock that night she was found to be in a state of shock. The blood pressure was unrecordable and she was pale and had symptoms of air hunger. An intravenous cannula was inserted into the right internal saphenous vein, and in an effort to raise the blood pressure she was given "Plasmosan" (1620 millilitres), albumin, 25% (400 millilitres), blood (400 millilitres) and saline, 0·9% (1500 millilitres), in a period of two and a half hours. During this time the blood pressure was checked many times, but was unrecordable. It was noticed while the infusion was being administered that the patient had lower abdominal distension; however, shifting dullness could not be detected. A perforation of the uterus was diagnosed, but the subsequent history proved that this had not occurred.

Suddenly, at 12.30 a.m., the patient began to cough and became cyanosed and breathless, and when she was propped up it was found that the blood pressure was 120 millimetres of mercury, systolic, and 80 millimetres, diastolic, her respirations numbered 32 per minute, and coarse crepitations could be heard over both lung fields. It was obvious that pulmonary œdema had developed. A venepuncture was immediately performed and 200 millilitres of blood were withdrawn. This gave her some relief, and as the blood pressure appeared to be stable and as she herself had improved with the administration of oxygen, further medication was stopped.

Her condition continued to improve during the morning and afternoon of that day; however, on the next day (January 22) she was more distressed and cyanosed, and the lung crepitations were more pronounced. Her hæmoglobin value was 55% (8·3 grammes *per centum*); accordingly a venepuncture was performed, 980 millilitres of blood were withdrawn, and at the same time 350 millilitres of a concentrated suspension of red blood cells were transfused. This resulted in a great improvement in her condition. Her respiratory rate fell from 32 to 26 per minute, her breathing was easier and her colour improved.

She had remained oliguric since her collapse on the previous night, and had been maintained on a regime of conservative treatment as for anuria, but her condition was never good. Gallop rhythm was present, and crepitations could be heard over both lung fields. Conservative treatment was continued; but although the urinary output of the patient increased, her blood urea content continued to rise, and the serum potassium concentration remained at a high level (Figure I).

[1] Read at the annual meeting of the Urological Society of Australasia, Surfers' Paradise, April 16 to 19, 1956.

On January 31 she began to vomit, and on February 1 her condition was poor, the liver was enlarged and tender, and she was listless and vomiting. It seemed evident that she would not have the strength to live sufficiently long for her kidney function to improve under conservative treatment, and accordingly she was treated on the same day by means of the artificial kidney. Towards the end of the dialysis she vomited some "coffee grounds", but she seemed brighter in herself. She vomited "coffee grounds" the next day, but her general condition improved. She had developed troublesome herpes on both lips and on her chin, and after dialysis a corneal ulcer developed. These conditions were treated with zinc cream and "Albucid" ointment and atropine drops respectively, and improvement occurred with improvement in her condition.

After dialysis the patient was maintained on conservative treatment until the blood urea level was clearly falling, and then she was given fruit and fruit drinks and gradually worked up to a full diet.

Figure I gives a record of the biochemical estimations made during her illness. The following observations may be noted: (i) the blood urea level continued to rise even when adequate quantities of urine were being passed; (ii) the blood urea level continued to rise after dialysis, though at a slower rate, and fell only when kidney function had improved sufficiently, as shown by a smaller daily ouput of urine; (iii) the levels of serum potassium and blood urea were dramatically lowered by dialysis.

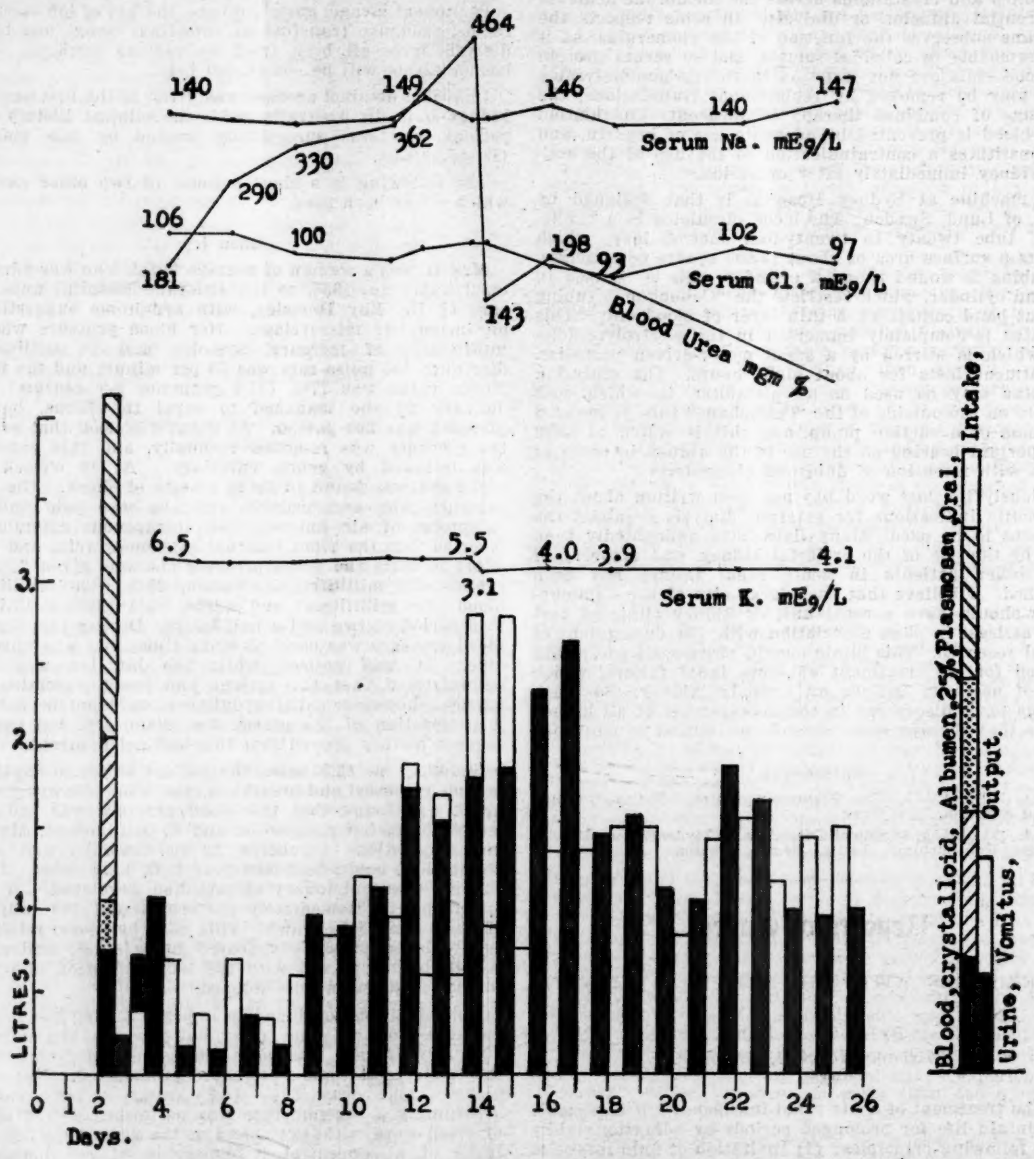

Figure I.

Mrs. O., admitted to hospital on January 19, 1956.

Figure II is a record of the changes which took place in the patient's blood during dialysis. The blood coming

from the patient into the artificial kidney has been designated "arterial", and the record indicates changes which occurred in the patient's blood. The blood being returned from the artificial kidney has been designated "venous", and the record indicates the changes produced in the blood by dialysis during the passage of blood through the kidney.

It can be seen that the blood which had been dialysed was returned to the patient with low blood urea and undoubtedly of value in bringing the treatment of this patient to a successful conclusion. The cause of her severe collapse in the first instance was never diagnosed. She was subsequently discharged from hospital in good condition.

Case II.

Mr. P., an adult male, aged thirty years, in good physical condition, was admitted to a surgical ward of the Brisbane Hospital, under the care of Professor N. Sutton,

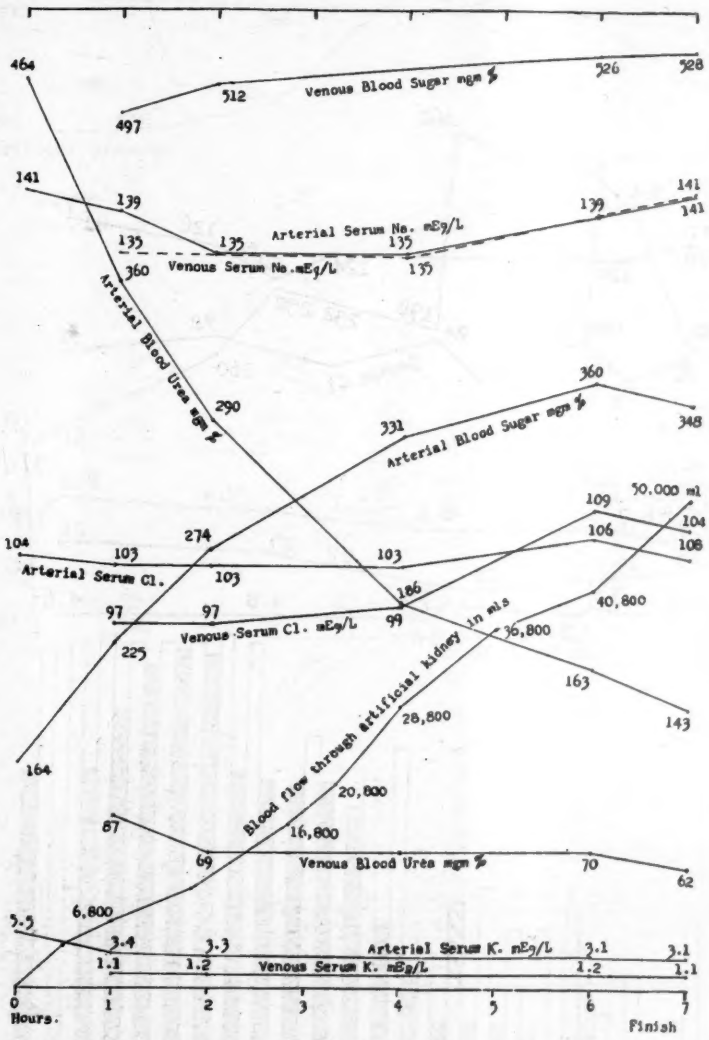

FIGURE II.
Changes produced in the blood of Mrs. O. during dialysis on February 1, 1956.

serum potassium levels and a high blood sugar level. As a result, the patient's blood urea and serum potassium levels fell and the blood sugar level rose, as indicated by the changes observed in the "arterial" blood. No obvious changes were produced in the serum sodium or serum chloride levels.

The dialysis of 50 litres of blood in seven hours, during which the patient's blood urea level fell from 464 to 143 milligrammes per 100 millilitres and her serum potassium level from 5·5 to 3·1 milliequivalents per litre, was

on June 22, 1955, at 5 p.m. The history given was that he had fallen 75 feet down a sewerage shaft. When admitted to hospital he would not answer questions, but merely rolled about in bed and grunted. Both pupils were widely dilated and equal, and reacted to light. His reflexes were normal, and he responded to painful stimuli. His blood pressure was 90 millimetres of mercury, systolic, and 40 millimetres, diastolic, and the pulse rate was 114 per minute. He was found to have a Colles's fracture of the left radius, a fracture of the left iliac crest with little

displacement, a fracture of the right lower ribs, multiple abrasions of the right loin, and a hæmatoma over the right iliac crest. His abdomen was slightly guarded but shifting dullness could not be detected.

At 5.45 p.m. shock supervened, the blood pressure fell to 55 millimetres of mercury, systolic, and 30 millimetres, diastolic, and the pulse became rapid and feeble. He was immediately given two pints of "Plasmosan" intravenously, which raised the blood pressure to 130 millimetres of mercury, systolic. He became fully conscious after this and was able to give an account of himself.

At midnight that night it was noticed that his abdomen was distended; it was painless, and shifting dullness could not be elicited. Only a few drops of blood-stained urine had been passed. It was evident that a huge retroperitoneal hæmatoma had developed, that bleeding was still going on, and that it had been chiefly responsible for his collapse soon after his admission to hospital. Intravenous therapy was continued during the night, and he received four bottles of blood during the night, which served to maintain his blood pressure at 120 millimetres of mercury, systolic, and 80 millimetres, diastolic.

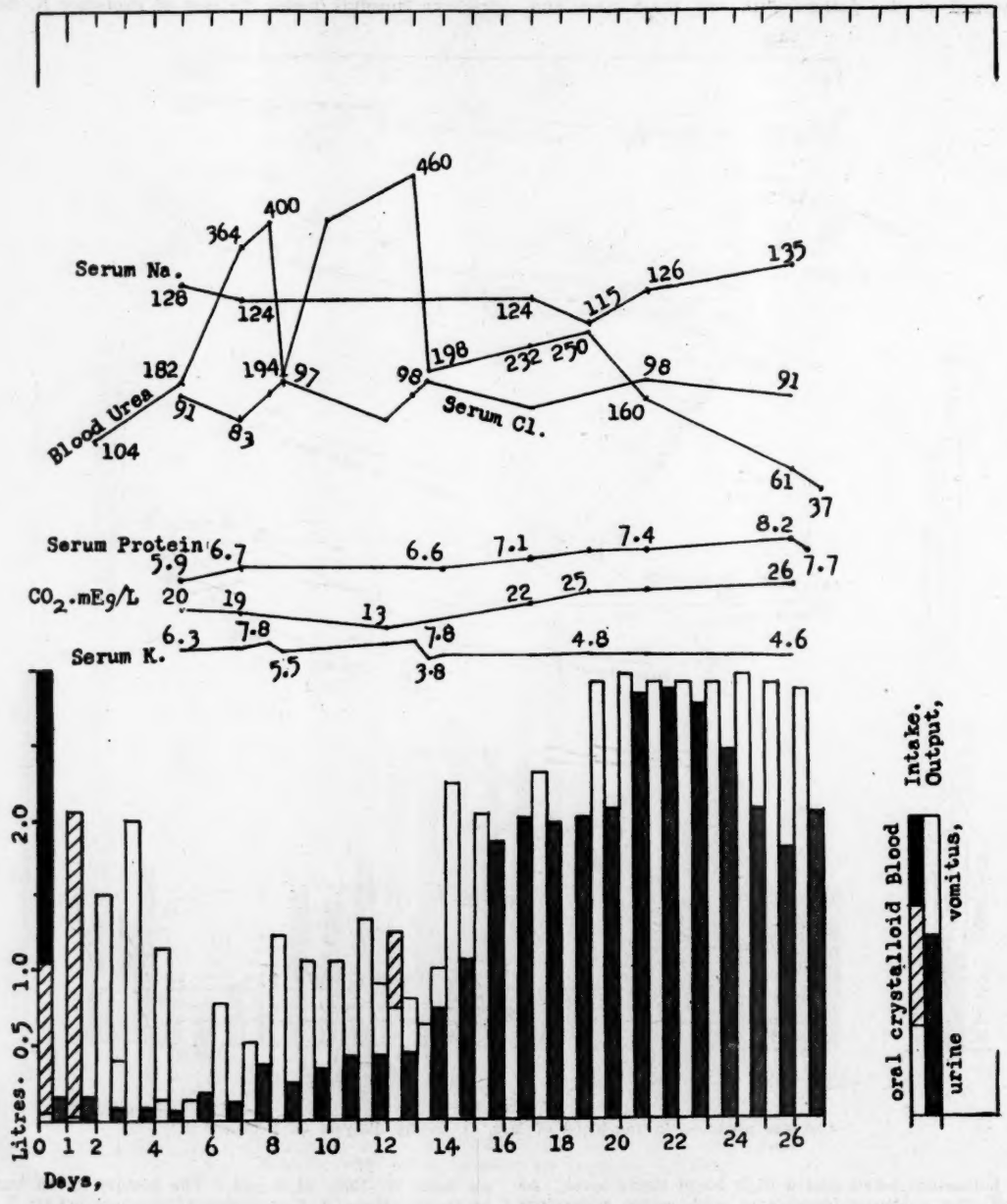

FIGURE III.

Mr. P., admitted to hospital on June 22, 1955.

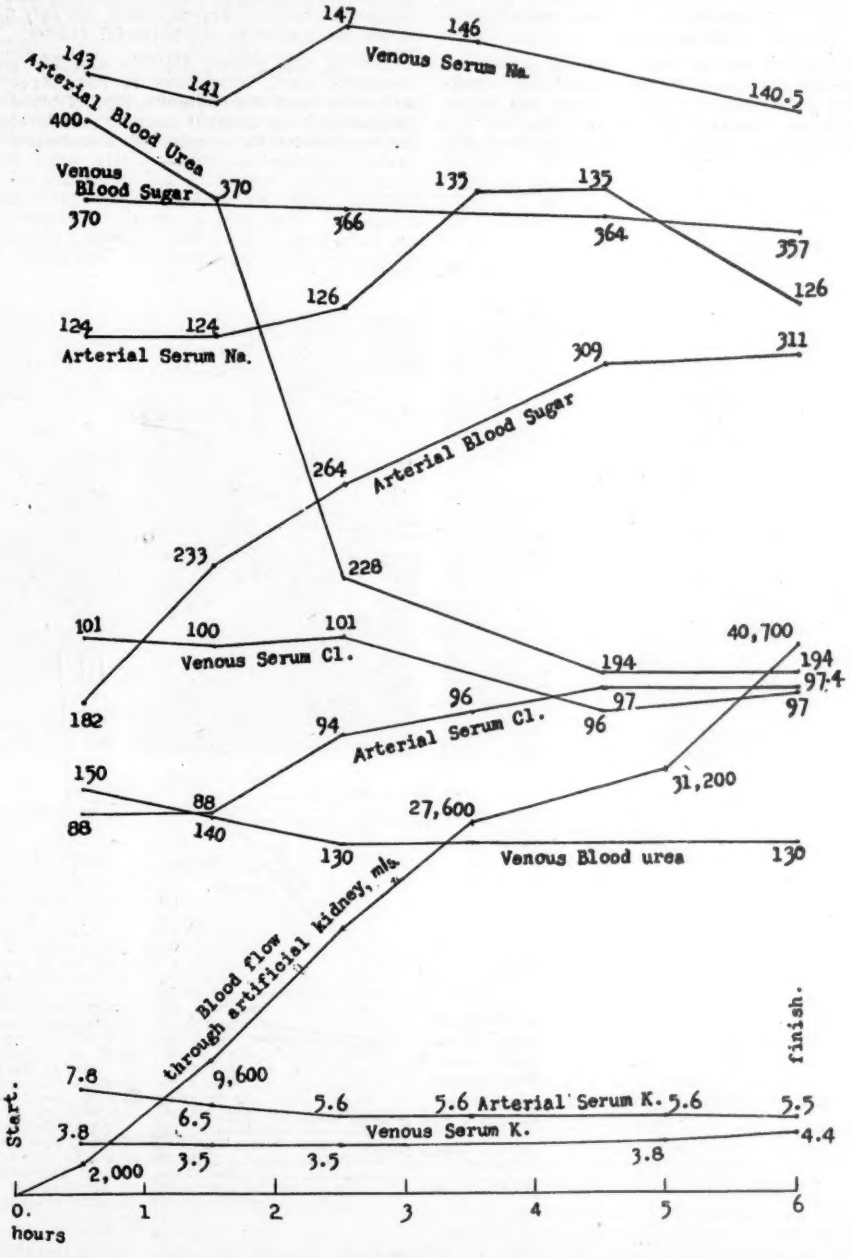

FIGURE IV.

Mr. P.: dialysis on June 30, 1955; changes produced in the blood of the patient. Figures for the arterial and venous serum sodium, potassium and chloride content are given in milliequivalents per litre. The arterial and venous blood sugar values are in milligrammes per 100 millilitres.

The next day (June 23) the fracture of the radius was set by Dr. R. Shannon. Bleeding into the retroperitoneal hæmatoma continued, and at 10 o'clock that night the loin hæmatoma was very large and his abdomen was distended and painful. Respirations were rapid and grunting, but the blood pressure was maintained.

On June 24 he was fairly comfortable, though anuric. As he was able to take fluids by mouth in small quantities, he was started on a regime of conservative treatment for anuria.

During the next few days his general condition remained good. He was rational, cooperative and cheerful; but he remained oliguric, and the blood urea and serum potassium levels continued to rise. On June 29 he had a bruise extending from the back of the neck to his thighs, his conjunctivæ were icteric, and he had begun to vomit. The blood pressure at this time was 160 millimetres of mercury, systolic, and 90 millimetres, diastolic, and on June 30 it was 166 millimetres of mercury, systolic, and 90 millimetres, diastolic. As the blood urea and the serum

potassium levels had risen to 400 milligrammes per 100 millilitres and 7·8 milliequivalents per litre respectively, he was treated with the artificial kidney.

He had a few shivers during the course of treatment, but drowsed most of the time. He was sufficiently awake at visiting hours to converse with his wife and father when they came to see him at this time while dialysis was in progress. His general condition remained good during treatment with the artificial kidney, and he was much improved after it.

Conservative treatment for anuria was continued after dialysis, but after the initial improvement shown the patient's condition deteriorated, he became irritable and non-cooperative, and vomiting set in once more. The blood pressure, which had fallen to 100 millimetres of mercury, systolic, and 75 millimetres, diastolic, after dialysis, had risen again, this time to 190 millimetres of mercury, systolic, and 115 millimetres, diastolic. The serum potassium and blood urea levels had also risen again to dangerous heights, and therefore, on July 5, he was treated a second time with the artificial kidney.

During this second dialysis also his general condition remained good, once more it was improved by dialysis, and once more the concentrations of blood urea and serum potassium were brought down to safe levels, and once more he was started on a course of conservative treatment. The blood urea and serum potassium levels rose again after this second dialysis; but the rise was more gradual, and after reaching a peak level on the sixth day after the second dialysis the blood urea level fell to a normal figure and remained there under the control of improved kidney function.

As in the case of Mrs. O., this patient's diet was increased as kidney function improved, and he was subsequently discharged from hospital with no complaint apart from weakness of the left hand and loss of weight.

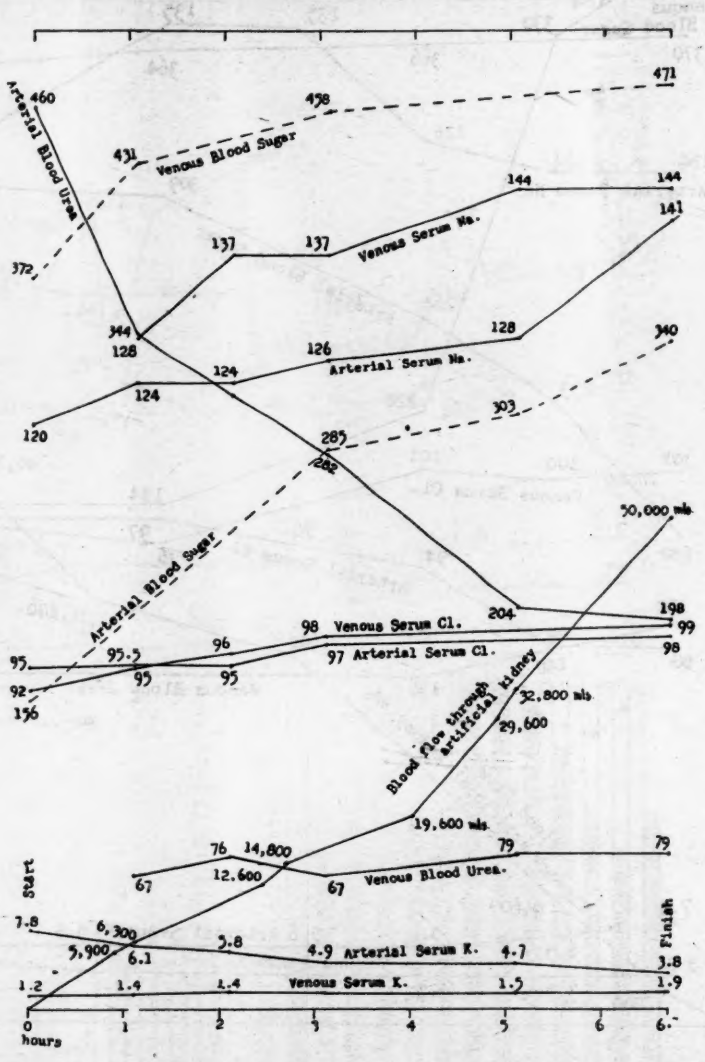

FIGURE V.

Mr. P.: dialysis on July 5, 1955: changes produced in the blood of the patient. Figures for the arterial and venous serum sodium, potassium and chloride content are given in milliequivalents per litre. The arterial and venous blood sugar values are in milligrammes per 100 millilitres.

He developed orchitis prior to his second dialysis, probably as a result of a catheter infection. This was cured at the time of his discharge from hospital.

Figure III depicts the biochemical changes which took place in this case during the course of the illness.

The following observations are of interest: (i) The rise in blood urea and serum potassium levels was dramatically controlled by dialysis and the concentration in the blood brought to a safe level. (ii) Although the volume of urine was adequate, the quality of the urine was inadequate to ensure that sufficient urea and potassium were removed from the circulation to maintain a safe level. Adequate renal control was not regained until twenty days after the original injury. (iii) The voluminous diuresis resulted in extracellular dehydration, as evidenced by the rise in serum protein level after the second dialysis. This was righted with the return of concentrating power of the kidney.

In Figures IV and V the changes that occurred during the course of the two dialyses can be seen. The pattern is similar to that already seen in the case of Mrs. O., and reported as having occurred in the case of Mrs. B. (Dique, 1955). There occurred the same dramatic fall in the blood urea and serum potassium levels and the same rise of blood sugar level, all of which must be ascribed to the quality of the "Cellophane" used. The hours during which treatment lasted, the quantity of blood which was dialysed, and the degree of clearance achieved in its passage through the artificial kidney can also be clearly seen in the graphs.

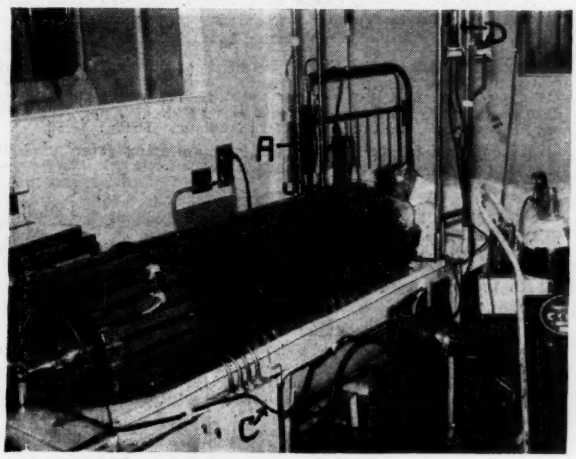

FIGURE VI.

The artificial kidney in use. Blood from the patient's radial artery is led alternately into the graduated cylinders at A. While one cylinder is being filled, the other is allowed to empty into a stationary tube which conducts it to a gland. This connects it to another tube which is rotating longitudinally, and which passes through the axle of the hollow drum B and is connected to it. The blood is then led from this last tube into a length of "Cellophane" tube, which is wound around the hollow drum. After travelling the length of the "Cellophane" tubing the blood is led through a second gland through the axle at the other end of the hollow drum, and after passing through the tube C is pumped by an electrically activated Julian Smith pump into the graduated flasks at D. While one flask is being filled, the other is allowed to empty by gravity into a tube connected to a glass cannula in a vein of the patient. The Julian Smith pump E has adjustable speeds. The rotations of the hollow drum propel the blood along the length of the "Cellophane". Waste products diffuse out of the "Cellophane" into the bath water, and dextrose diffuses in. Proteins, blood cells, bacteria and toxins are unable to pass through the "Cellophane". The blood which flows out of the radial artery and into the vein of the patient is measured continuously during the whole of a working period by two workers on opposite sides of the machine so that the correct balance is achieved at all times.

Discussion.

It is not possible to discuss all aspects of dialysis in a short paper, but the following should be mentioned.

Prior to the commencement of dialysis it is essential to have the following: (i) a good clinical history of the case; (ii) an estimation of the serum sodium, potassium, chloride and protein levels, the hæmoglobin value and also the blood urea content; (iii) a clinical estimate of the patient's condition; (iv) proof of patency of the ureters.

If it is found that an abnormal electrolyte pattern exists, it can be corrected to some extent prior to dialysis by the use of repair fluids.

If there is a tendency to heart failure, "Digoxin" may be administered, or perhaps venesection may be performed in order that any physiological strain on the patient may be reduced.

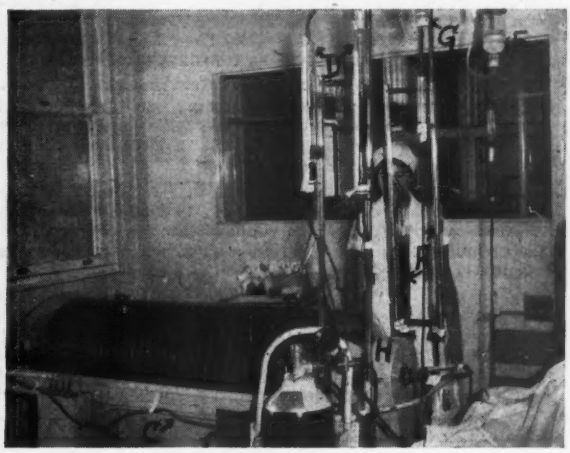

FIGURE VII.

The artificial kidney in use. The two saline bottles at F and G are used respectively to flush out the apparatus before use, and to infuse heparin into the patient while the machine is in use. H is the hood over the chain which is used to rotate the hollow drum by an electric motor situated under the bath. For description of A, B, C, D, and E see Figure VI.

During dialysis it is generally impossible to have any biochemical estimate performed, except perhaps that of the serum potassium content or the coagulation time; in any case, although they are desirable, these tests may be dispensed with, and all specimens taken during dialysis may be examined when it is convenient to do so.

If the constituents of the water in the bath are measured accurately, it seems only necessary to ensure that the blood is prevented from clotting during dialysis, and that the patient's blood volume is kept constant.

Potassium chloride may be left out of the bath water entirely if the patient's serum potassium level is known to be high. At other times potassium chloride may be added to the bath water, so as to make the concentration of potassium equal half to two-thirds of the normal serum potassium level. This will prevent the serum potassium concentration from falling to a dangerously low level.

The following may be regarded as indications for treatment: (i) anuria or oliguria for seven to ten days; (ii) a serum potassium content of over seven milliequivalents per litre; (iii) a blood urea content of 350 to 400 milligrammes per 100 millilitres of blood; (iv) sepsis; (v) complicating factors—for example, injury or old age.

Reactions During Dialysis.

Apprehension about dialysis has not been a feature of the patients treated, probably because each patient has

previously been sedated with 0·25 grain of morphine prior to dialysis.

Every patient treated suffered from either a shiver or a rigor at some time during the course of dialysis. This was probably due to pyrogenic substances present in the "Cellophane" tubing. These pyrogenic substances are removed to some extent by boiling the tubing and subsequently rinsing the whole apparatus with 10 litres of 0·9% saline. Whenever a reaction occurred, it was treated by morphine given subcutaneously, and the use of hot-water bottles and blankets; apart from some degree of discomfort to the patient, no harm seems to have resulted.

A pink, punctate, papular, generalized rash appeared after four dialyses in the patients treated. The cause was not found; it was thought to be a penicillin rash at the time, but it could have resulted from the heparin or the salmine sulphate or from diffusible substances liberated from the "Cellophane". In one patient this rash appeared twice—that is, after each dialysis. The rash was not itchy, and disappeared spontaneously a few days after dialysis.

Two patients complained of itchiness during dialysis. Once again morphine was used to combat the effects of the agent responsible. In both cases this appeared to be successful. The agent responsible might have been present in the "Cellophane" tubing or heparin.

Hæmorrhage from the gums, and in the case of Mrs. O. from labial herpes as well, occurred in sufficient quantity in three cases to make the vomitus like "coffee grounds" till about twelve hours after dialysis. It was never sufficiently severe to be dangerous.

One patient (Mrs. P., whose history is not given here) had just commenced to menstruate at the time when she was first dialysed. No increase of bleeding resulted, probably because the massive dose of heparin used had turned her into a temporary hæmophiliac, but certainly not into a temporary thrombocytopenic purpura patient.

Every patient treated was given salmine sulphate after dialysis to counteract the effect of the heparin used during dialysis.

No patient died as a direct result of the treatment given. Hyperpyrexia did not occur. Hypotension of mild degree occurred in two patients, Mrs. O. and Mr. P., on the day after dialysis. This has been proved by other workers to be caused by hypotensive substances present in the "Cellophane" tubing. In all cases it passed off spontaneously without untoward effect.

Technical Difficulties.

Small leaks in the "Cellophane" tubing occurred on three occasions. When they were discovered, the tubing was wiped at the site of the leak with ether, cut, and joined with a tube of "Nylex".

On one occasion the "Cellophane" tubing snapped—fortunately near the distal end. The distal part of the apparatus was flushed with saline, the tubing was joined and the dialysis continued uneventfully.

Clotting of the blood in the apparatus occurred twice. The clotting was ascribed to the diffusion out of the apparatus of citrate ions (though this was not proved). In order to prevent this, sodium citrate, 40 grammes per 50 litres of fluid, was added to the bath water. Since citrate has been added to the bath water, no further clotting has occurred in the machine during dialysis.

Hæmodialysis is at present the most rapid method known for bringing about a sudden fall in serum levels of potassium, urea, and such other dialysable substances as contribute to the syndrome of uræmia. It is to be expected that with improvements in the technique and apparatus used this form of therapy will be used more frequently in the coming years.

Acknowledgements.

I wish to thank Dr. A. D. D. Pye, General Superintendent of the Brisbane Hospital, Professor N. Sutton and Dr. Roy Hemsley for permission to publish these cases in detail.

Reference.

DIQUE, J. C. A. (1955), "The Artificial Kidney in the Treatment of Severe Puerperal Infection due to Clostridium Welchii, with Report of a Case", M. J. AUSTRALIA, 1: 781.

Books Received.

[The mention of a book in this column does not imply that no review will appear in a subsequent issue.]

"Hypnotism and Crime", by Heinz E. Hammerschlag, translated from the German and with a foreword by Professor John Cohen; 1956. London: Rider and Company. 7¼" × 5", pp. 148. Price: 13s. 6d.

A study of famous cases of crime alleged to have been committed under hypnosis.

"Practical Diagnosis and Treatment of Liver Disease", by Carroll Moton Leevy, M.D., with a foreword by Franklin M. Hanger, M.D., and illustrations by Felix Traugott; 1957. New York: Paul B. Hoeber, Incorporated. 9½" × 6½", pp. 350, with 84 illustrations, including 23 in full colour. Price: $8.50.

Based on a study of 1000 patients suffering from various hepatic disorders.

"Soybeans: For Health, Longevity and Economy", by Philip S. Chen, Ph.D., with the assistance of Helen D. Chen, M.A.; 1956. South Lancaster, Massachusetts: The Chemical Elements. 8" × 5¼", pp. 255, with illustrations. Price: $3.00.

An exposition of the nutritional virtues and uses of soybeans.

"The Head and Neck in Roentgen Diagnosis", by Eugene P. Pendergrass, M.D., J. Parsons Schaeffer, M.D., Ph.D., and Philip J. Hodes, M.D.; Volumes I and II; Second Edition, 1957. Oxford: Blackwell Scientific Publications. 10" × 6½", pp. 1996, with 1740 illustrations. Price: £14.

Based on the principle that "radiology must be correlated and integrated intimately with apposite facts" in other branches of medicine.

"Sequeira's Diseases of the Skin", by John T. Ingram, M.D. (Lond.), F.R.C.P. (Lond.), and Reginald T. Brain, M.D. (Lond.), F.R.C.P. (Lond.); Sixth Edition, 1957. London: J. and A. Churchill, Limited. 9½" × 6", pp. 856, with 63 coloured plates and 426 text figures. Price: 105s.

The previous edition was published in 1947. Much of the text has been rewritten.

"The Natural Development of the Child: A Guide for Parents, Teachers, Students and Others", by Agatha H. Bowley, Ph.D., F.B.Psy.S., with a foreword by D. R. MacCalman, M.D.; Fourth Edition, 1957. Edinburgh and London: E. and S. Livingstone, Limited. 7½" × 4¾", pp. 224, with 84 photographs. Price: 10s. 6d.

This book has been revised since the third edition of 1948.

"Atlas of Tumors of the Nervous System", by H. M. Zimmerman, M.D., Martin G. Netsky, M.D., and Leo M. Davidoff, M.D.; 1956. Philadelphia: Lea and Febiger. Sydney: Angus and Robertson, Limited. 10½" × 7¾", pp. 192, with 277 illustrations, 233 in colour. Price: £13 15s.

Most of the illustrations are in colour. The text material is minimal in amount.

"A Companion in Surgical Studies", by Ian Aird, Ch.M., F.R.C.S., and the Staff of the Department of Surgery, Postgraduate Medical School; Second Edition, 1957. Edinburgh and London: E. and S. Livingstone, Limited. 9½" × 7½", pp. 1314, with two illustrations. Price: 84s.

The first edition appeared in 1949. About one-third of the text in the present edition is new or rewritten.

"The Care of the Expectant Mother", by Josephine Barnes, M.A., D.M. (Oxon.), M.R.C.P. (London), F.R.C.S. (England), F.R.C.O.G.; 1956. London: Pitman Medical Publishing Company, Limited. 8½" × 5½", pp. 280, with illustrations. Price: 30s.

Written as a practical guide for all who undertake the management of pregnancy.

The Medical Journal of Australia

SATURDAY, APRIL 13, 1957.

All articles submitted for publication in this journal should be typed with double or treble spacing. Carbon copies should not be sent. Authors are requested to avoid the use of abbreviations and not to underline either words or phrases.

References to articles and books should be carefully checked. In a reference the following information should be given: surname of author, initials of author, year, full title of article, name of journal, volume, number of first page of the article. The abbreviations used for the titles of journals are those adopted by the Quarterly Cumulative Index Medicus. If a reference is made to an abstract of a paper, the name of the original journal, together with that of the journal in which the abstract has appeared, should be given with full date in each instance.

Authors who are not accustomed to preparing drawings or photographic prints for reproduction are invited to seek the advice of the Editor.

SURGERY AT THE PERIPHERY.

An Australian surgeon tells of how he read an account of a new operation on the hip. The article, which appeared in a well-known surgical journal, was written by an internationally famous British surgeon. The Australian surgeon tried the operation, with disappointing results. Thinking that the fault might be his, he tried again, but the results were no better. Not long afterwards he visited England and met the internationally famous surgeon. When the time seemed ripe, he mentioned the unsuccessful operation, seeking for guidance. To his surprise the internationally famous surgeon replied with a criticism of the surgical journal—and of journals generally. The trouble, it appeared, was that journals took so long to publish articles that the articles were out of date when they appeared. He had given up the operation as unsatisfactory before his description of it had appeared in print. The Australian surgeon was presumably too polite to comment, but he made a mental note to distrust the future writings of the internationally famous surgeon. An operation which failed to survive the short period of literary gestation and came into the world stillborn was surely ill conceived and did no honour to its parent.

This true story is not an isolated happening. We find a similar complaint coming from an American surgeon, presumably referring to colleagues in his own continent. This surgeon, Kenneth B. Castleton,[1] analyses the fault quite bluntly. First, there is too great haste in reporting new but unproven developments and procedures. Second, some surgeons are reluctant or tardy to report their unfavourable results and reversals of procedure—to the great confusion of the surgeon in what the Americans call the "grass roots" area and to the detriment of his patients. Very appositely Castleton comments: "If the surgeon who first reported the procedure would be in as great a hurry to report his poor results as he was in his initial report, much of this difficulty would be avoided." The ideal situation is of course that new procedures should not be reported until they have been thoroughly tried, with the thought well in mind that the procedure successful in the hands of the rare brilliant surgeon is not always suitable to be passed on lightly to his more pedestrian colleagues. At the same time, even with established procedures and in fields other than surgery, good results are more prominent in medical literature than poor results. Some surgeons do report their results frankly and carry out careful long-term follow-up studies. But if this had been the general practice, it is reasonable to think that there would be less confusion in such fields of surgery as the two cited by Castleton—the surgical treatment of peptic ulcer and of carcinoma of the breast. Castleton makes a reasonable plea for more cooperative and combined studies on controversial surgical problems by large surgical institutions. This should help to keep the unfavourable results as much in focus as the favourable and the long-term results as much as the short-term, with advantage to surgery generally.

Castleton also acknowledges that the "grass roots surgeon" (by implication he includes himself in this group) is often at fault in adopting surgical procedures on the basis of preliminary reports and without adequate studies and follow-up reports. He likes to think himself up to date and even more to have others think it, but a little more patience and humility would do him and his patients more good in the long run. Castleton does not mention the problem of the inadequately trained surgeon who takes on too much—a difficult problem in many countries and one which has brought the general practitioner in this country under criticism, not always justly. The principle is very dear to the medical profession that any man who is qualified and registered to practise must be free to give to his patients whatever treatment he thinks is right. Any attempt to restrict this right, to limit by licensing or other means the scope of any doctor's potential practice, is to be resisted. At the same time, the conscience of the individual doctor and the force of opinion in the profession as a whole towards maintaining a sense of responsibility need to be kept strong and active. This is a major factor in the attitude of the medical profession towards modifications in the standard of medical registration. Despite improvements in communication, increase in the number of specialists in country centres, and so on, it is still a matter of hard necessity at times for the country practitioner to be able to handle any emergency that may arise, and to relieve his patients of the need for long and costly journeys as far as is reasonably possible. Thus we have the long-established tradition of a high standard in Australian general practice, a tradition which is accepted not only in the country, but also in the cities and large towns, where it might otherwise have been modified by the ready availability of specialists. With it comes the insistence that the individual doctor should decide what treatment is best for his patient and whether

[1] *Surg., Gynec. & Obst.*, August, 1956.

he is able to carry it out, be it the administration of the latest medical treatment, such as radioisotopes, or the performance of a surgical operation. On this idea, as a principle, there would probably be widespread agreement in all sections of the medical profession, but its maintenance depends upon a continued high standard of medical practice in all its branches. This in turn depends not only on maintaining high registration standards, but on constant critical self-appraisal and study by the practising doctor, including the general practitioner. Knowledge and skill do not come without effort and training—and the practice of surgery demands both. In relation to this it would ill serve medical practice and the profession to start building exaggerated legends about the Australian general practitioner. The Australian soldier has suffered from such legends, including the idea that he is a natural soldier who needs to undergo no training but only to have a gun thrust into his hands. Those who know and admire the Australian soldier laugh at such a legend, and those who esteem the Australian general practitioner will wish to defend him from anything of the kind. Much more to the point is such an approach as that of the College of General Practitioners, which, while upholding the status of the general practitioner, has set out to encourage and indeed to insist upon training and regular study on the part of its members. There is surely a real need for cooperation by the whole medical profession in this matter, and especially in solving the problem of surgery in general practice. It is unrealistic to suggest that general practitioners must never perform major surgical operations except in grave emergencies, for then will they be most unfit to deal with the occasional grave emergency. On the other hand, it is wrong for the general practitioner to have to gain his experience by the hard way. The solution may not be easy to find, but a round-table conference of representatives of the Royal Australasian College of Surgeons, the Australian Faculties of the College of General Practitioners, and the Post-Graduate Federation should produce something helpful. The British Medical Association could do a real service by sponsoring such a conference.

Current Comment.

THE HISTORY OF A GREAT HOSPITAL: L'HOTEL-DIEU AND ITS SURGEONS.

SOME account has already been given of the history of the *Hôtel-Dieu*, from the point of view of its actual buildings and its functions.[1] The story may be carried a step further by a brief reference to the surgeons who served this first hospital of Paris, with which is closely linked the development of the teaching and practice of medicine in France. A convenient point in time from which to start is the period following the storming of the Bastille. This event made no sudden changes in the hospital's sphere of activities; its administrators, although they offered to resign, were left in their positions, and the Augustinian Sisters continued their work in spite of the violent elimination of the monasteries and the confiscation of church property.[2] The only change, as we have seen before, was in the name of the hospital, which became "*Le Grand Hospice d'Humanité*". In accordance with the Declaration of the Rights of Man and of the Citizen, which proclaimed that "public assistance is a sacred obligation", successive Assemblies took it upon themselves to reorganize the hospitals. The Convention ordered the transfer of part of the patients to disaffected religious institutions. The Directory restored autonomy to the hospitals, by giving them back their property. Finally, under the Consulate, the *Conseil général des Hospices* was established; this marked the beginning of unity of control, and the administration so instituted maintained stability and regularity in the work of the hospitals until 1948, when the *Assistance publique* was set up. Under the Consulate also the house-surgeoncy of the Paris hospitals was established.

The reorganization of the Faculty of Medicine proceeded simultaneously with that of the hospitals. Under the Constituant Assembly the old Faculty was falling into desuetude; it had awarded no diplomas since 1785. Its teaching had been reduced to the enunciation of rules and definitions; it held that Hippocrates had said all that there was to be said. In 1793, two decrees abolished all teaching bodies and learned societies. One year later it became imperative to reestablish them, because of the urgent necessity to recruit medical practitioners for the forces. In accordance with a report by Fourcroy to the Convention in 1794, three schools of health were set up, at Paris, Montpellier and Strasbourg. The basic requirements were entirely altered; students were now required to learn by observation to practise their art. In Fourcroy's words, their motto was to be: "Read little, observe much and do much." Further, the union of medicine with surgery under the ægis of the Faculty was finally decided. "*Le Grand Hospice d'Humanité*" (the *Hôtel-Dieu*) was chosen as the clinical school for surgery, and "*L'Hôpital de l'Unité*" (the *Charité*) was used for the teaching of internal medicine. At the *Charité*, Desbois de Rochefort, who died early, and later his pupil Corvisart had organized clinical lectures at the bedside, which were immensely popular. Napoleon's doctor was the first professor of clinical medicine at the reconstituted Faculty. At the *Hôtel-Dieu*, Desault had ten years previously instituted clinical instruction. He was now fifty years old, and at the height of his career; he was naturally chosen as the first teacher of the out-patient clinical work. Desault gave his whole day to the *Hôtel-Dieu*, teaching and demonstrating. He opened his department to all students, and more than 400 attended at a time. The time-table which he drew up for them kept them well occupied with lectures, demonstrations and practical work in the hospital; they began work at six o'clock in the morning, and the final session began at six o'clock at night. In their moments of leisure, if any, the students were required to carry out dissections and operations on the cadaver and to make and set up any apparatus needed. The teaching was free; the only requisites were decent behaviour, diligence and love of work on the part of the students. From 1794 a political condition was imposed—an unimpeachable devotion to the civil order established by the Revolution. Desault had no choice but to submit. He had hailed the Revolution with sincere enthusiasm, but rapidly deplored the excesses committed in its name. He had frequently crossed swords with the authorities, and had even been haled before the Tribunal for having attended with more care than was thought necessary the little prince imprisoned in the Temple. Petitions signed by his students and his patients were presented, and he was released; but he remained under suspicion of being lukewarm. It is probable that his early death was the result of these events, and there is some suspicion that he may have been poisoned for refusing to have any part in the murder of the prince. Just about this time Xavier Bichat, after his differences with the authorities at Lyon, decided to continue his studies in Paris. He immediately fell under the spell of Desault and his great ability, and attracted his attention. Desault appointed him a supernumerary to the hospital, and with his wife took a great interest in the young man. Desault died in 1795 (a cruel blow for Bichat); but his widow kept up her practical help to him, and he in his turn reverently carried on and extended the work of his master. Desault's place as professor of clinical surgery was taken by Pelletan. Shallow and lazy,

[1] M. J. AUSTRALIA,
[2] G. Menegaux, *Presse méd.*, December 15, 1956.

he was by no means of the stature of his predecessor; but he had as a colleague a man of considerable force of character, rough, self-assertive and self-confident—Guillaume Dupuytren, the second surgeon of the *Hôtel-Dieu*. Conflict between these two opposites smouldered for a while, and then blazed into open warfare. There were faults on both sides, as there always are; Pelletan's behaviour, on the whole, was rather the better. Dupuytren was appointed professor of operative medicine, and there was a short respite. The end came simultaneously with the occupation of Paris by the Allies, as a result of two surgical operations performed by Pelletan. The second was on a Russian soldier, and the Russian authorities complained. An inquiry was held, and Dupuytren was promoted to Pelletan's position, while Pelletan took his. The old master was finally ousted. Dupuytren organized his department with military precision; he tolerated no levity, no slightest departure from strict observance of his rules. None the less, he had extraordinary gifts. He inspired complete confidence in his patients. He showed both wisdom and boldness in his decisions to operate, in his operative technique and in his post-operative care. He was a learned and inspiring teacher, and undoubtedly he was in the first rank of surgeons of his time. If one of his aims was to outshine the memory of Desault, another was to raise surgery to the status of a science, and to free it from the subordinate role which it had played up till then. He carried on his work with great determination for twenty years; but his arrogance and his desire to oust others made many enemies for him. He quarrelled with Laennec, one of his first pupils; with Boyer, his master, whom he had first revered, and who had initiated him into the practice of surgery; later with Richerand, with Lisfranc, and with countless others. He deliberately ignored the work of Récamier, his colleague at the *Hôtel-Dieu*, who devised and performed the first vaginal hysterectomy. After the death of the Duke of Berry in 1820, the ill-feeling reached its height. Dupuytren had actually opened the thorax of the duke, disregarding the current practice of simple closure of chest wounds. However, the Court took no part in the public criticism to which Dupuytren was subjected, and he was created a baron and appointed chief surgeon to His Majesty Louis XVIII. During the uprisings which later occurred in Paris, Dupuytren's surgical service maintained its high standard; in 1830 on one occasion the *Hôtel-Dieu* cared for 800 wounded. He always succeeded in upholding the inviolability of the hospital, and turning away police inquiries from his patients. Dupuytren did not leave a great deal of written work—he had not the time. However, he will always be remembered for his description of the fracture of the instep and the contracture of the palm of the hand which are named after him. He died in 1835.

From the death of Dupuytren until the present day there have been 12 professors of clinical surgery at the *Hôtel-Dieu*, and their names form a distinguished list. The present holder of the chair is G. Menegaux, who has written the story of this great hospital, which has been intimately bound up with the history of France from the earliest times.

THE NATURE OF ESSENTIAL HYPERTENSION.

ESSENTIAL HYPERTENSION accounts for the greater number of the cases of hypertension met with clinically, but its pathogenesis and nature are still not fully understood. Two papers have appeared recently which give useful discussions and suggestions on the nature of hypertension. One is an editorial by G. E. Wakerlin[1] on the "Pathogenesis of Essential Hypertension"; the other is a long paper on "The Nature of Essential Hypertension" by J. Bauer.[2] Wakerlin draws attention to methods which have proved successful in producing a form of persistent hypertension in animals which resembles, but is not idential with, essential hypertension in man. These include strong stimulation of the nervous system in rats selected for emotional instability, and section of carotid sinus and aortic depressor nerves. The hypertension so produced differs in many respects from essential hypertension, particularly in its effect on the heart. Similar results are obtained by ligation of the carotid arteries. The relation of the secretons of various endocrine glands to essential hypertension has been much studied, but Wakerlin states that "the burden of proof is on those, including Selye, who maintain that altered anterior-pituitary-adrenal cortex function is pathogenic in essential hypertension".

The renal origin of hypertension has been much canvassed, even though there may be no visible changes in the kidneys in essential hypertension. Hypertension produced in dogs by constriction of the renal arteries resembles essential hypertension in many respects, and can go on to malignant hypertension with the resulting pathological changes in the heart and blood vessels; but it is not identical. Bauer points out that different pathological processes of various organs may cause arterial hypertension. These types of hypertension differ from essential hypertension and are known as secondary or symptomatic hypertension. Symptomatic hypertension is encountered in diseases of the uropoietic system such as glomerulonephritis. A humoral factor, renin, produced by the ischæmic kidney is the pathogenic factor. Essential hypertension is primarily a functional state without anatomical basis. Bauer draws attention to the great importance of considering homœostasis of blood pressure in any discussion of the nature of essential hypertension. In any individual the habitual blood pressure is not invariable, but it is brought back to the original level if it has been altered temporarily by various factors, both physical and psychic. Stress is the term applied to these factors, and more commonly the stress raises the blood pressure. By habitual blood pressure is meant the basic pressure *plus* the rise due to the minor activities of the day. If the homœostatic "feedback mechanism" becomes deficient, and the normal reduction of raised blood pressure fails to occur, the stage is set for the development of permanent hypertension. The habitual blood pressure of healthy and presumably normal persons varies greatly. It may be persistently low or persistently high or anything between. Chinese, who have normally a low habitual blood pressure, may show all the manifestations of essential hypertension, including changes in the heart and eyes, with a blood pressure as low as 130 to 140 millimetres of mercury, systolic, and 85 to 90 millimetres, diastolic.

Homœostasis depends on the fundamental attribute of living organisms, the ability to adapt, and nervous and hormonal and other factors are all involved. The body produces hypertensive substances, such as adrenaline, arterenol and cortical steroids and VEM, and hypotensive substances, such as histamine, acetylcholine, VDM and others, and there must be a balance between these for homœostasis. Essential hypertension develops if the homœostatic mechanism of blood pressure fails to function properly. Persons with essential hypertension are known to be hyperreactors to vasopressor stimuli. Their supplementary blood pressure is therefore a larger fraction of their habitual blood pressure than is the case in normal persons. They are also hyperreactors to vasodilating stimuli. Acetyl-β-methylcholine injected into persons with essential hypertension lowers their systolic and diastolic blood pressure three to four times more than it lowers the blood pressure of normals. It is interesting to note that dogs with hypertension produced artificially by constriction of renal vessels do not show hyperreaction to acetyl-β-methyl choline, yet many people believe that the condition in the dog is the same as essential hypertension in man. All homœostatic mechanisms have developed gradually during evolution, and one of the most important adaptations for maintaining relative constancy of blood pressure had to be made when man assumed the vertical position. Failure of the mechanism to overcome the effect of gravity on the blood pressure is sometimes seen in asthenic persons, and similar failure can be produced by

[1] *Circulation*, January, 1957.
[2] *Arch. Int. Med.*, January, 1957.

chemical paralysis of the sympathetic vasoconstrictors. A number of factors are concerned in the homœostasis of the blood pressure in man; and as man is more often exposed to vasoconstrictor than vasodilator stimuli, the failure of homœostasis will eventually result in elevation of the blood pressure.

It has been shown quite definitely that the chief factor in the development of essential hypertension is heredity. Bauer discusses at some length the nature of the hereditary factors. He considers that the hereditary changes are the result of what is called "continuous variability", which implies multifactorial, polygenic heredity. This means that there are gradual differences of precision and decline in the factors concerned, rather than sharp limits between normal and abnormal. In essential hypertension the factors concerned in homœostasis of blood pressure differ from normal, not in kind, but quantitatively. Bauer prefers to call the condition constitutional hypertension. "Is hypertension a disease?" has been asked many times, and Bauer's answer is: "No. Not on its own." If the inadequately controlled blood pressure rises too high, then appear changes in the heart and blood vessels and other parts which constitute a disease. The vascular and cardiac changes may develop rapidly or very slowly, depending on the relative efficiency of the homœostatic mechanisms. Quite mild constitutional hypertension can be converted into a iatrogenic disease by careless statements about the raised blood pressure, and the person (not yet a patient) with a raised blood pressure should be reassured and carefully instructed as to his mode of life. Not the high blood pressure, but the patient with the high blood pressure as a whole, must be taken care of. The development of his case is quite logical and reasonable, and Bauer has given the physician much to think about.

SPACE TRAVEL AND THE CLOCK PARADOX.

Not only has the general theory of relativity been responsible for changes of considerable magnitude in thinking as far as physics is concerned, but it has now impinged upon medical thought. One of the predictions of Einstein's theory is that if one of identical twin brothers leaves home and spends a long time travelling at high speeds with respect to his home inertial frame (as, for example, in a space ship), he will return home physiologically younger than his twin who remained at home; moreover, his watch will have performed correspondingly fewer revolutions. This is a staggering thought; and if we have become just a little *blasé* in an atomic world about Einstein's work, then contemplation about this spatial behaviour of twins will very quickly reproduce an awful frame of mind. The theory does, in fact, have a great deal to do with medical thought, and shows once again that we cannot afford to bury our heads in the sands as a protection against intellectual effort.

Confirmation of this prediction is obviously a necessary thing, and F. S. Crawford[1] has attempted an experimental verification of this prediction. He states that three assumptions are sufficient: (i) The time dilatation of special relativity holds for uniform motion. (ii) The acceleration of an ideal clock relative to an inertial system has no influence on the rate of the clock, and the increase in the proper time of the clock at any time is the same as that of the standard clocks in the system in which the clock is momentarily at rest. (iii) The traveller and his pocket watch are good approximations to an ideal clock (the acceleration must not kill the traveller or break his watch).

A round trip is not necessary for proof of the asymmetrical aging effect. A one-way trip can be made, and age comparisons be made from destination to starting point by signals. A return can be made at a snail's pace, when it will be observed that the age gain acquired on the outward journey is maintained on the return journey. Crawford states that mesons are suitable substitutes for brothers, and that already published work upon mesons under various conditions of acceleration and deceleration at sea level and at heights verifies his three assumptions. His work is convincing, and we are now presented with a vista of medicine which is changing again, and which will probably ask us to shed more of our prejudices.

[1] *Nature*, January 5, 1957.

ULTRA-VIOLET STERILIZATION.

Crystals of tyrosin have been reported in several places as occurring in meat sterilized by ultra-violet irradiation. Tyrosin, it may be mentioned, is the least soluble of the constituent amino acids of protein. The occurrence of other amino acids was surmised, and this conjecture proved to be true. As most amino acids are bitter, the meat suffered in palatability. Research on this problem has revealed a curious anomaly.[1] Proteolytic enzymes display greater resistance than bacteria to irradiation; this is the reverse of what happens in heat sterilization, for the proteolytic enzymes are more thermolabile than bacteria. This finding may not seem to bear any relation to human health or disease, unless very indirectly through nutrition. However, sterilization by irradiation has been employed in many fields of medical science, for example, in the preparation of human plasma for transfusion; here such sterilization has been occasionally found to be unsatisfactory, and heat sterilization after demineralization has been proposed as a superior method (see THE MEDICAL JOURNAL OF AUSTRALIA, March 9, 1957, page 325). Before meat is subjected to ultra-violet treatment it is suggested that the proteolytic enzymes should be destroyed by pasteurizing heat. It is possible that this consideration should be kept in mind when irradiation is employed to produce sterilization in any system in which enzymes and corresponding substrates are present.

LÉON LE FORT: A PIONEER IN THE CONCEPT OF CONTAGION.

Léon Le Fort, a French surgeon who was born in 1829 and died in 1893, is remembered chiefly for the operation that he devised for the alleviation of extreme uterine prolapse. The operation consists in the triangular resection of the anterior and posterior vaginal walls, followed by suture to retain the prolapsed organs within the vaginal cavity. In spite of certain disadvantages, the procedure is so simple and safe that it is still used in some circumstances. H. Speert[2] has given an interesting account of the events surrounding the introduction of the operation in 1877, and has reproduced in translation Le Fort's own account of the case in which he first performed it. This paper is well worth reading. However, of equally great, if not greater, interest are some of Le Fort's other activities. In the days before the science of bacteriology existed, he became keenly interested in the concept of contagion, like his contemporary, Étienne Stéphane Tarnier, the obstetrician. (Tarnier, it will be remembered, early adopted antiseptic measures in obstetrics. He also invented an axis-traction forceps and described a sign of inevitable abortion, both of which bear his name.) Le Fort based his concepts entirely on statistical reasoning. In 1865 he made a statistical investigation of 1,823,093 births in England, Ireland, Holland, Belgium, Germany, Austria-Hungary, Russia, Sweden and Switzerland; he compared the results of home deliveries with those of deliveries conducted in hospitals. This study was sponsored by the director of hospital administration; but he refused to publish Le Fort's report, because his conclusions, based on the doctrine of contagion, were entirely contrary to existing ideas. (We think inevitably of Ignaz Philipp

[1] *Science*, January 4, 1957, page 25.
[2] *Surg., Gynec. & Obst.*, January, 1957.

Semmelweis.) Le Fort applied the principles of asepsis in his surgical work at the *Hôpital Cochin* in 1867, and in the next two years he performed seven leg and thigh amputations without a single death—a remarkable achievement, since the mortality rate of such operations had been as high as 65·7% in the rest of Paris.

Le Fort was an ardent defender of civil liberties—so much so that in December, 1851, he had taken part in the revolt against the *coup d'état*, and had narrowly escaped being imprisoned. This trait in his character prompted him to demand justice for women accused of prostitution. In a debate on the public prophylaxis of syphilis before the *Académie de médecine* in 1888, he declared that he respected the law and hated despotism; to protect the public health, he demanded a law; to protect a woman who might be accused unjustly, he demanded judges. Le Fort's professional interests included medical administration, military medicine, public health and demography, and he published numerous papers. He ligated the common carotid to cure pulsatile exophthalmos, and he was the first in France to perform nephrectomy in the treatment of ureteral fistula. In 1873 he was appointed to the chair of surgery in Paris, and he was elected president of the *Société de chirurgie* in 1875. He died on October 19, 1893, at the age of sixty-four years.

THE OPHTHALMOSCOPE AND THE ONSET OF DEATH.

THE standard signs used to determine that death has occurred, and to estimate when it occurred, are well known. However, little is written in most standard works on the subject about one interesting and useful aspect—the changes observable with the ophthalmoscope. These have been redescribed by J. Kevorkian,[1] who has correlated them with electrocardiographic records by means of coloured photographs of the *fundus oculi*. He states that as the circulation slows, the arterial blood columns become granular and the vessels become narrower. Within a minute of death the arterial pattern disappears. The choroid becomes pale yellow-orange when the circulation stops, and the optic disk becomes dead white, being sharply demarcated from the retina, which, gradually over a period of hours, changes through grey-yellow to deep grey. The colour of the retina is modified somewhat by the amount of pigment in the choroid.

The most important features, however, are those to be seen in the venous system. When there is absence of cardiac output, the columns of venous blood become granular and segmented. When such signs are seen, they indicate cessation of blood flow to the eyes and, therefore, to the brain. However, the venous segments continue to move and spill over the edge of the physiological cup for at least ten minutes after complete stagnation of blood. When these signs are produced experimentally, functional restoration of the circulation totally abolishes them in a few seconds. Therefore, by examining the *fundus oculi*, it is possible to distinguish between apparent and actual death, to determine (within a certain range) the time elapsed after death, and (a point of great importance) to indicate the possibility of success from efforts at resuscitation.

ECOLOGY AND MORAL PHILOSOPHY.

MEDICAL THOUGHT is becoming increasingly aware of the necessity for rethinking in medicine, particularly on a general scale: rethinking not as a replacement but as a complement. A recent leading article[2] on the contribution of medicine to history touched on innumerable medical problems, solved and unsolved. Many of these were past events, yet our knowledge and understanding of them and their implications is tragically small. Our path to a brave new world is not only devious and rocky; it seems at times non-existent. This seeming pessimism is one reflection of the efforts of India to emerge as an efficient economical unit. India's first five-year plan began six years ago, and her second five-year plan almost one year ago. Already the second plan has run into financial hazard—a happening which is by no means strange to us. It is an industrial plan, and most necessary. However, it is a moot point as to which part of the problem of India is the obverse. The simplest of obstacles are not touched, and indeed one wonders how they may ever be touched.

India has teeming underfed millions, with an alarming morbidity and mortality. Yet of 198 million cows only one-sixth produce any milk; and one-fifth of all the cows are totally useless—useless except for providing fuel, since pats of dung are India's only readily available fuel. The pedigree of the cows is poor, the animals are sacred, and the dung is an infective nidus. The underfed depend upon home-grown food in the main (70% of the total food consumed), but the average land-holding is the economically useless figure of 7·5 acres, and the yield of crops per acre 800 pounds—compared with 3500 pounds per acre in Japan. The increase in agricultural output from 1949 to 1956 was of the order of 14%. This shows an appalling problem, to which there seems no answer in the immediate or foreseeable future.

How can improvements be grafted on to a society? We should think perhaps that we do not understand our own problems, and should certainly think that radicalism is not necessarily pragmatism; and that pragmatism is not necessarily right. Burke would have us proceed organically, and we must remember that his objection to the French Revolution was on moral grounds. Burke taught us that the moral right must be learned from our knowledge of the past and from our contemporaries. We must know ourselves and evolve. When we look at the world's medical problems, we become painfully aware of our shortcomings.

VITRUVIUS AND LEAD POISONING.

MARCUS VITRUVIUS POLLIO was a Roman architect and engineer in the time of the Emperor Augustus. Little is known of him, apart from what can be gleaned from his writings, the most famous of which was "*De Architectura*". Although the theoretical and historical parts of his work are taken from Greek writers, the practical portions are obviously the result of his own experience; they are competent and clear. Frontinus mentions his name in connexion with the aqueducts of Rome, and most of Pliny's description of wall painting and practical details in building is taken without acknowledgement from Vitruvius. In a paper on lead poisoning from water in Paris, R. Worms, C. Albahary and H. G. Schlumberger[1] cite Vitruvius as one of the early writers on the subject, and quote a passage from "*De Architectura*", of which the following is a free translation:

> Earthenware pipes have the advantage of being very easily repaired when necessary, and the water in them is much better than that in leaden pipes. In the latter white lead forms, which is considered very dangerous, and very harmful to the body; and indeed, it seems that lead cannot be regarded as good for the health if what arises from it is dangerous. This is proved by the example of plumbers, who are generally very pale, on account of the vapour which arises from the lead when it is cast, and which, penetrating the body, burns the parts and contaminates the blood. The result is that one may say that in order to have wholesome water, it must not be carried in leaden pipes; moreover, it is more palatable when it is carried in earthenware pipes.

This surely is a striking example of clinical acumen on the part of an early member of a non-medical profession.

[1] *Am. J. Path.*, November-December, 1956.
[2] M. J. AUSTRALIA, March 23, 1957.

[1] *Presse méd.*, January 30, 1957.

Abstracts from Medical Literature.

BACTERIOLOGY AND IMMUNOLOGY.

Antibacterial Activity of Two New Antibiotics.

W. F. Jones, R. L. Nichols and M. Finland (*J. Lab. & Clin. Med.*, May, 1956) have recorded the antibacterial activity of streptonivicin and cathomycin, two new antibiotics. Each was developed in the laboratories of a commercial firm from a previously unstudied streptomyces species, and so came to be given different species names. This paper describes the tests of in-vitro activity of the antibiotics against aerobic bacterial species, and the results are such as to suggest that the two drugs are almost identical in their action. The trade name of one of them is "Albamycin". *Staphylococcus aureus* was tested on horse blood agar plates, the series containing twofold dilutions of the antibiotics; a reading was taken after twenty-four hours' incubation at 37° C., the dilutions beginning at 400 microgrammes per millilitre of medium; growth was inhibited by 0·8 microgramme per millilitre. The spectrum of the two antibiotics for a large range of organisms was tested against both substances, and the resistant ones to the highest concentration included Gram-negative organisms generally. *Streptococcus viridans* was irregular in response, some strains being inhibited by 3·0 microgrammes per millilitre, others needing 50 microgrammes per millilitre to inhibit growth; this type of result also appeared with *Strep. pyogenes*. The addition to the medium of horse serum increased the level of the minimum inhibitory concentration. Attempts were made to study acquired resistance to the drug, and *Staph. aureus* appeared to acquire resistance to 400 microgrammes per millilitre after seven to twenty subcultures. No attempt was made to study the toxicity of the substances in animals. The authors conclude that these two new antibiotics are almost identical.

Two Antibodies of Related Specificity Separated by Centrifugation.

D. W. Talmage, G. G. Freter and W. H. Taliaferro (*J. Infect. Dis.*, May-June, 1956) have studied two antibodies of related specificity, but different hæmolytic efficiency, separated by centrifugation. The answer to the question why some antibodies perform a given function more efficiently than others is not settled, and two theories are put forward: one is that specificity and reactivity of the antibody itself vary, the other is that the differences lie in the physical properties of the antibody. The authors prepared antisera to the Forsmann antigen by injecting rabbits with heated sheep red cell stroma suspensions, and then further injected two of the animals with a further amount of suspension. Both sera were absorbed with red cell stroma to remove the Forsmann antibody, four treatments being carried out. Then all sera were diluted one in four in saline and centrifuged in a Spinco refrigerated centrifuge. The top, middle and bottom layers were then tested for combining and hæmolytic activity. The results showed an increase in ratio from top to bottom, indicating the presence of two substances with different sedimentation constants, different also in hæmolytic efficiency. The authors discuss their findings in the face of the unitarian theory of antibodies.

Tissue Culture Analysis of Tuberculin Hypersensitivity.

E. F. O'Neill and C. B. Favour (*Am. Rev. Tuberc.*, November, 1955) have carried out an analysis of tuberculin hypersensitivity in man by a modified tissue culture technique. They used capillary tubes of heparinized blood which had been centrifuged, freed of its blood platelets and mixed with plasma and tuberculin, and then incubated. Examination of the tubes after overnight incubation showed that the leucocytes had migrated from the buffy coat layer along the walls of the tube, so that the distance of their migration could be measured under standard conditions, and a cytotoxic index devised by comparison with control preparations from which tuberculin had been omitted. The authors used material from three groups of patients—namely, normal tuberculin-negative controls, normal tuberculin-positive controls and tuberculous patients. The first series of experiments was conducted with autologous preparations of cells and plasma from the same patient tested against varying doses of tuberculin. This established 0·1 milligramme of tuberculin as a suitable dose to produce detectable inhibition of migration of cells in tuberculous plasma compared with normal serum, in which, however, there was always some effect. The next series was designed to vary the plasma effect with a fixed dose of tuberculin on the cells of others in the groups, and on the cells of groups of plasma from the same group. Normal cells suspended in tuberculous plasma showed a significant fall in migration distance, and tuberculous cells suspended in other tuberculous plasma also maintained a fall in migration distance. The results, however, do not show uniform tuberculin toxicity of cells either from tuberculin-positive normals or from patients, and the authors feel tempted to correlate variations with features of individual patients; however, this relationship could not be established. They suggest that there is a humoral factor present in the plasma and that specialized cells involved must be present locally where the tuberculin is exhibited for tissue damage to take place.

HYGIENE.

Epidemiology of Civilian Streptococcal Outbreaks Before and After Penicillin Prophylaxis.

D. C. Poskanzer, H. A. Feldman, W. G. Beadenkopf, K. Kuboda, A. Drislane and E. L. Diamond (*Am. J. Pub. Health*, December, 1956) treated two epidemics of streptococcal disease in rural communities by the mass oral administration of potassium penicillin G to the school populations. In one community 250,000 units were given twice daily for ten consecutive days, with a marked and prolonged decline in both the carrier rate and clinical cases. In the second community 250,000 units of potassium penicillin G were administered only once daily for ten consecutive days; this resulted in a minimal fall in the carrier rate and a prompt return to a high level of infection and clinical illness. A study conducted in 56 families of the school children of one community revealed that the children aged four to seven years had the highest rate of infection (79%), while only 10% of the adults were infected. Information is presented on the school-wide and familial occurrence of the different types and groups.

Experimental Treatment of Poisoning from Fission Products.

S. H. Cohn, J. K. Gong and W. L. Milne (*Arch. Indust. Health*, December, 1956) measured the ability of zirconium citrate and edathamil sodium to alter the distribution and retention of both an injected mixture of long-lived fission products and an inhaled mixture of short-lived fission products. The most effective chemical agent for the prevention of skeletal deposition of both short-lived and long-lived fission products is zirconium citrate, preferably administered shortly before injection or exposure. After-treatment is also useful, within limits. Treatment which reduces the skeletal deposition effectively increases the deposition in the soft tissues other than liver; this effect was noted with the zirconium citrate. The most effective treatment for reducing the content of mixed fission products in the liver was pre-treatment with edathamil and after-treatment with zirconium citrate.

A Serological and Clinical Survey of Poliomyelitis and the Response to Salk Vaccine.

L. L. Coriell, K. Schaffer, H. M. Felton, H. Fernandes-Moran and M. Z. Bierly (*Am. J. Pub. Health*, November, 1956), by means of a serologic survey of antibodies for all three types of polio virus in children from Caracas, Venezuela, and Galveston, Texas, showed that infection occurs in infancy in the children who attend free medical clinics in each city. A group of children from families of university staff in Galveston presented a very low incidence of naturally acquired antibody for all three polio viruses. A survey of clinical poliomyelitis in the two cities for the past ten years shows that 85% of reported cases occur in children under four years of age in Caracas, whereas in Galveston there are two periods of peak incidence corresponding to early infancy and to later childhood and adulthood. Evidence is presented that within the temperate zone geography is of minor importance in determining the epidemiology of poliomyelitis, and that personal hygiene and living standards are the significant factors. Administration of the Salk vaccine stimulated antibody formation in all groups of children—that is to say, those with or without a high percentage

of naturally acquired antibody. The vaccine would therefore appear to be effective in those individuals who need it most because they have not experienced previous infection.

A Study of Periodic School Medical Examinations.

A. YANKAUER AND R. LAWRENCE (*Am. J. Pub. Health*, December, 1956) followed a group of 901 first-grade school children with unusually careful annual medical examinations for a period of one to three years, 704 of the children being followed for three years. Of the children followed, 14% developed new adverse conditions. Of the 40 new adverse conditions, neither known nor under care at the time of the periodic medical examination, all but nine could have been discovered by means other than the performance of a medical examination. The 2263 medical examinations performed gave a case-finding yield of one child per 251 examinations. Analysis of these findings is presented in some detail and their implications are discussed. It is concluded that periodic school medical examinations during the first four years of elementary school are of little value from a case-finding standpoint.

Use of Antibiotics for the Preservation of Fish and Sea Foods.

J. W. BOYD, H. M. BLUHM, C. R. MUIRHEAD AND H. L. A. TARR (*Am. J. Pub. Health*, December, 1956) discuss the results of extensive commercial trials with block ice containing chlortetracycline for the preservation of fish and other sea foods. The results have been very favourable, though really adequate sampling of large vessel loads of fish has not proved practicable. The results obtained in one such trial have been recorded. The search for antibiotics or other substances which could prove valuable in preventing microbiological spoiling of fish or fish waste products is continuing, and the results at trials with several new antibiotics and furan derivatives are presented. It has been argued that suppression of the natural bacterial flora of fish by introduction of chlortetracycline might create favourable conditions for growth of food poisoning organisms should these be present, but these studies indicate that this is unlikely to occur with *Clostridium botulinum* type E and with enterotoxigenic staphylococci. There is undoubtedly room for further work along these lines, particularly with shellfish. In conclusion, it is important to refer to the question of chlortetracycline residues in fish flesh. All available published information suggests that these would either be absent or be present in negligible amounts in cooked fish.

Radiological Hazards Due to Exposure to Low Energy Radiation in Veterinarians.

A. ABRAHAMS, S. J. HARRIS, I. PAUL AND G. W. PAUL (*Arch. Indust. Health*, December, 1956) discuss the results of a survey of radiation hazards at veterinary establishments. Measurements of the intensity of the radiation and estimates of the duration of exposure revealed the existence of potentially hazardous conditions in a considerable proportion of establishments. Actual damage had occurred in some veterinarians. Fluoroscopy presented greater hazard than radiography and was in more extensive use. Lack of "safety consciousness" in choice and use of equipment and neglect of protective measures added to the hazards. A number of factors necessary to adequate control are discussed. These relate to the cardinal radiation protection principles of time, distance and shielding. These measures can be effective only when intelligently applied by knowledgeable persons.

Estimation of Blood Cholinesterase Activity.

J. M. FLEISHER, G. ST. WOODSON AND L. SIMET (*Arch. Indust. Health*, December, 1956) describe a rapid visual test for the determination of cholinesterase activity in human whole blood, with acetylcholine as substrate, based upon a colour change of bromothymol blue. The visual method, in which whole blood samples are used with the appropriate substrate, shows close correlation with electrometric methods, in which use is made of red blood cells or plasma, in determining the depression in cholinesterase activity due to anticholinesterase *in vitro* and with red blood cells *in vivo*. When the pre-exposure cholinesterase activity is known, inhibition in excess of 25% may be distinguished.

SURGERY.

One-Stage Total Colectomy for Ulcerative Colitis.

L. FALLIS (*Am. J. Surg.*, November, 1956), for the treatment of ulcerative colitis, performs ileostomy and removes the colon, rectum and anus entirely through the abdomen. He states that the elimination of the perineal portion of the operation avoids the change in position of the patient which so often produces shock. Furthermore, he states that there is less blood loss in this operation since there is only minimal perineal dissection. The resulting perineal wound heals promptly. He has employed this technique on 29 patients with satisfaction.

Evaluation of Routine Operative Cholangiography.

D. O. FERRIS AND H. M. WEBBER (*Arch. Surg.*, August, 1956), having experienced frustration upon overlooking a stone which showed in a post-operative cholangiogram, were prompted to evaluate operative cholangiography. This is the X-ray examination of the biliary tract with the aid of a radioopaque medium instilled into the bile ducts during the actual operation. Technically satisfactory results may be obtained with portable equipment. To prevent the medium from flowing too rapidly into the duodenum before it has completely outlined the bile ducts, the authors introduce 10 millilitres of 0·1 normal hydrochloric acid into the duodenum. This has produced good results in 175 cases without any untoward effects. A careful technique with intimate cooperation of the radiologist, anæsthetist and surgeon is vital if technically satisfactory results are to be obtained. The method is described in detail, and a report given on the 185 cases in which the method was used. A normal condition was correctly revealed in 125 cases, and in 14 cases the method correctly revealed the presence of a stone which had been suspected clinically. In 44 other cases, information yielded was deemed to be of value. The authors are of the opinion that operative cholangiography can be carried out without increasing the operative risk, that it is of definite value, and that it is an important addition to a surgeon's armamentarium.

Œsophagitis and Hiatal Hernia.

R. WOODRUFF AND A. E. JAMES (*Arch. Surg.*, June, 1956) maintain that œsophagitis manifested by epigastric pain and distress, retrosternal burning, belching and dysphagia, ulceration and bleeding is most commonly due to œsophageal hiatal hernia of the sliding type. Schmidt, at the Mayo Clinic, found that among 170 patients with benign regurgitant ulceration at the œsophago-gastric junction, 158 had that type of hiatal hernia. The normal valvular action at the œsophago-gastric junction is maintained by the fixed angulation of the junction as it passes through the aperture in the right crus of the diaphragm. To Allison must be given the credit for recognizing the importance of preserving the muscular action of the right crus, as well as maintaining the normal fixation and angulation at the œsophago-gastric junction. The authors present the technique they use and their results, and state that the principles of their repair conform closely to those of Allison, but they have elected to use the abdominal approach. They consider that the abdominal approach is less traumatizing and less time-consuming, and offers a simultaneous approach to other intraabdominal disease. This type of repair has been used in 11 sliding œsophageal herniæ, and the results of the operation in all patients have been most gratifying.

The Subphrenic Abscess.

W. GERWIG AND B. BLADES (*Ann. Surg.*, September, 1956) state that subphrenic abscesses can and do occur in patients while they are receiving antibiotic drugs. The abscess, when camouflaged by antibiotics, may present an innocent clinical picture in the early stages. Escape from drug influence may be so sudden that the patient who has been progressing satisfactorily may become critically ill very quickly. *Staphylococcus aureus* is frequently the offending pathogen, and is usually sensitive to "Chloromycetin".

Protein and Growth Rates of Puppies.

J. ALLEN, E. STEMMER AND L. HEAD (*Ann. Surg.*, September, 1956) show that litter-mate pups maintained for ninety-nine days on intravenously administered plasma as the only source of protein achieved a gain in height and weight at least equal to that of their litter mates receiving the same quantity of horse-meat and liver by mouth. Nitrogen balance studies under these conditions disclosed a positive nitrogen balance. Intravenously administered plasma appeared to be an excellent source of protein nutrition.

Medical Societies.

THE UROLOGICAL SOCIETY OF AUSTRALASIA.

The annual meeting of the Urological Society of Australasia was held at Surfers' Paradise, Queensland, on April 16 to 19, 1956, Dr. E. P. Row, the President, in the chair.

The Artificial Kidney.

Keith Kirkland (Sydney) read a paper entitled "The Treatment of Acute Renal Failure with the Artificial Kidney" (see page 506).

J. C. A. Dique (Brisbane) read a paper entitled "Experiences with the Artificial Kidney" (see page 507).

G. C. Hogg (Brisbane), in opening the discussion, asked Dr. Dique for details of the dialysable fluid. He said that not many patients needing the artificial kidney were seen in the practice of urologists, but it was interesting that at the last three meetings of the Urological Society of Australasia renal failure had been discussed. Dr. Hogg said that the urologist's place in the treatment of renal failure might be set out in the following seven categories: (i) The prevention of renal failure: (*a*) by the avoidance of hypotension and the maintenance of a normal blood pressure during surgical procedures; (*b*) by the giving of blood transfusions as required; it had to be remembered that there was always a danger from incompatible blood, and that if enough transfusions were given, some incompatible blood was bound to be given for some reason; (*c*) the avoidance of anoxia (that was the province of the anæsthetist). (ii) In transurethral surgery to the prostate, the avoidance of hæmolysis. (iii) Institution of the conservative regime if the patient was already oliguric. (iv) The exclusion of post-renal causes in cases of anuria, and the minimum investigation was the taking of a flat film, *plus* the introduction of ureteric catheters and sometimes retrograde pyelography. Cases of translucent stone and non-calculous hydronephrosis would have been "missed" if that full investigation had not been carried out. (v) Appropriate diet and rest. (vi) The avoidance of sepsis. (vii) The adequate débridement of damaged areas and drainage of abscesses to prevent an otherwise rapid rise in potassium ions. Then conservative measures, such as the intravenous administration of calcium ions to antagonize the rise in potassium ions, might be useful on occasion (first occasion only), and then it was always essential that external dialysis be instituted before it was too late.

Dr. Hogg then asked how many incompatible blood transfusions had been given at Brisbane General Hospital.

Dr. Dique, in reply, said that in the last four to six years there had been a few cases. One patient had been anæsthetized when he was given the wrong bottle (O recipient, given A blood). He had had no oliguria and had survived. Three other patients had been treated conservatively and had survived. All the patients were older people, and the question arose whether they had a lower antibody titre.

Dr. Hogg asked whether a sterile dialysate was used.

Dr. Dique replied that the fluid was not sterile; tap water with various additives was used. However, since it did not meet vital fluids except through "Cellophane", there was no necessity to sterilize it.

J. S. Peters (Melbourne) said that post-renal causes must always be excluded, and that that was an easy and essential investigation. During the stage of diuresis there was a large chloride and potassium ion loss, and it was important to give potassium ions at that stage.

Dr. Dique stressed the fact that potassium should be given only when the potassium level was known to be falling.

Colin Edwards (Sydney) pointed out that it was common experience that the distilled water given intravenously—a litre, for example—would only infrequently produce anuria. It was thus easy to understand that incompatible transfusion would not always produce anuria. Dr. Edwards asked what sort of team should be used for managing an artificial kidney.

Charles Ros (Brisbane) asked how clotting was prevented in the tube.

Dr. Dique, in reply, said that heparin was given in heavy doses—first an initial dose through the machine, *plus* a slow drip and a further dose of heparin just before the artery was exposed for the dialysis. In all 50,000 to 75,000 units of heparin were given in an average case. Hæmorrhage was common, and occurred from the lips and gums; however, the loss of blood at menstruation was not increased. There had been no intracerebral hæmorrhages or hæmatomata, and the clotting time had always returned to normal after eight hours. There had been one hæmorrhage from a slipped ligature. Protamine sulphate was given at the conclusion of the operation, but in doses much less than would be theoretically necessary.

Colin Edwards (Sydney) and E. P. Row (Brisbane) asked what mechanical staff was necessary.

Dr. Dique replied that mechanics were necessary only at the beginning of the procedure, but it was necessary to have an electrician on call to start the machine. The machine at the Brisbane General Hospital had been used only ten times.

J. B. Somerset (Melbourne) asked the cost of the machine.

Dr. Dique replied that the cost was £250; that included the cost of the electrician's time given to making the machine. A more recent machine had cost only £150.

I. F. Potts (Sydney) asked whether Dr. Dique had any experience of the use of the machine in phenobarbitone poisoning.

Dr. Dique replied that he had not used the machine in any such cases, and most such patients whom he had examined at the Brisbane General Hospital had recovered quickly.

Dr. Potts then asked what substances were particularly aimed against in cases managed with the artificial kidney.

Dr. Dique replied that potassium ions and urea were the most important substances; the carbon dioxide combining power was also important; that was managed with sodium lactate administration.

J. E. Blackman (Sydney) referred to the use of peanut-oil mixture in the conservative management of patients with anuria, and asked whether Dr. Dique had used the solution without the addition of peanut-oil, as the peanut-oil was very nauseating to the patient.

Dr. Dique replied that he had not, but that he had found no trouble with the patient's retaining that solution, or in intubating the duodenum of patients having the mixture.

J. B. Somerset (Melbourne) said that he had encountered a case of radio-translucent stone impacted at the pelvi-ureteric junction, in which a ureteric catheter had passed to 27 centimetres. No retrograde pyelographic examination had been performed and the diagnosis had been missed. Dr. Somerset said that he now always carried out a retrograde pyelographic examination in cases of anuria in which post-renal obstruction had to be excluded.

G. C. Hogg (Brisbane) asked whether the machine was of any use to patients who had been over-transfused.

Dr. Dique replied that it was quicker to bleed the patient and replace the blood with packed cells; but the machine could be used in such cases if the amount of glucose in the perfusion fluid was increased.

Colin Edwards (Sydney) asked what personnel were used in the management of the artificial kidney at Sydney Hospital.

Keith Kirkland (Sydney) replied that a doctor was always attending a patient during the machine's working, and a mechanic was on call; he stressed that those cases were never extremely urgent. He said that a complete service for the treatment of renal failure was envisaged at Sydney Hospital, and that would be managed by the clinical research unit there.

Artificial Breeding in Domestic Animals.

E. W. Moodie, of the Veterinary School, University of Queensland, read a paper entitled "Problems in the Artificial Breeding of Livestock" (see page 491).

The Mechanism of Ejaculation.

I. F. Potts (Sydney) read a paper entitled "The Mechanism of Ejaculation" (see page 495).

Obstructive Pathological Conditions and Infertility.

J. E. Blackman (Sydney) read a paper entitled "Obstructive Pathological Conditions in Relation to Infertility" (see page 497).

Chronic Prostatitis.

J. B. Somerset (Melbourne) read a paper entitled "Chronic Prostatitis" (see page 502).

J. J. POWER (Brisbane) said that in his own practice, although he had gone through a period of treating prostatitis, he later adopted the habit of sending patients suffering from chronic prostatitis to the venereologist. In days past he had tried injecting "Argyrol" along the vas and also injecting "Mercurochrome" through a perineal needle, but he believed that dilatation and massage remained the basic treatment. Dr. Power said that prostatitis was not always a serious disease. He could recall one case in which the patient had had chronic purulent prostatitis from 1919 to 1953, and that patient's general health had remained good over all those years. Dr. Power also said that arsenic was useful on occasions, and gave good results; that had not been mentioned. Prostatic neurosis was a very real entity on occasions. Dr. Power then proceeded to present the society with some out-moded instruments—a Kollmann's dilator and irrigator, and a rectal electrode which had been used in times past for giving diathermy to the prostate.

CHARLES ROE (Brisbane) said that Dr. Somerset's paper was an important paper for the younger urologists especially, for it was the younger urologist who encountered so many of those cases. He said that the condition was common, and patients might have chronic prostatitis for years which would flare up from time to time. Dr. Roe asked whether it was not possible that a hormone deficiency might establish or assist in the maintenance of the condition, or perhaps a pituitary dysfunction enable the inflammatory condition to become established. Perhaps, too, focal sepsis had some relation to chronic prostatitis, if not as a direct cause, then as an indirect cause by producing general debility. Better results were obtained in cases of chronic prostatitis in which the secretion expressed was plentiful; in cases in which that was not so, the disease was not relieved so easily. The presence of threads (macroscopically evident) was more important than the microscopic report on the urine (which was often reported as a few pus cells *et cetera*), and such a microscopic report might be misleading.

J. E. BLACKMAN (Sydney) asked how often Dr. Somerset thought that the seminal vesicle was also involved.

Dr. Somerset said that he thought such involvement very common.

Dr. Blackman also asked what material was used for urethrography.

Dr. Somerset said that "Neo-hydriol" was the substance used.

Dr. Blackman recalled one patient who had undergone coccygectomy and two patients on whom laminectomies had been performed, when the patients had had chronic prostatitis all along. He also mentioned a patient in the practice of Dr. H. H. Pearson who had received complete relief from one injection of streptomycin (one gramme) through a vasotomy.

O. J. ELLIS (Newcastle) said that knowledge of the subject was far from complete. It was his belief that if a patient was symptom-free after prostatic massage, and if there were only a few pus cells (15 to 20) in the massage specimen, then he could be regarded as cured. However, if pus in more profuse quantities remained in the specimen, then one had merely to wait for a recurrence. Dr. Ellis said that he thought "Furadantin" might be of some use in some of those cases.

KEITH KIRKLAND (Sydney) said that not always the first prostatic bead contained pus in cases of prostatitis, and sometimes massage on two or three occasions might be necessary before pus could be found and a diagnosis established.

I. F. POTTS discussed the fertility of patients with chronic prostatitis. He said that pus in the prostatic secretion appeared to affect the motility of the spermatozoa, but local treatment did not produce an improvement in the count; some low motility was due to testicular deficiency rather than to prostatic inflammation. Dr. Potts said that 60% of specimens of semen were sterile, whereas 40% contained diphtheroids, *Staphylococcus albus* and enterococci. He asked if those organisms could be regarded as contaminants from the urethra.

COLIN EDWARDS (Sydney) said that he believed that a swollen vesicle might on occasions block a ureter; he believed with Dr. Kirkland that massage on several occasions might be necessary for diagnosis. Dr. Edwards thought that there was still some place for the use of the rectal electrode, diathermy and not endothermy being employed; he also said that in some cases prostatitis was essentially an aseptic process, and in those cases there was a mechanical factor creating a block of the prostatic ducts *et cetera*. For diagnosis he regarded the presence of normal constituents rather than the presence or absence of pus to be of great significance, and for a satisfactory index of progress lecithin bodies were necessary. Dr. Edwards also said that constant shaking (for example, on a tractor or motor-bicycle) prevented a cure. The Belfields operation was useful on occasions, and in selected cases vesiculectomy instead of prostatectomy was of value. Dr. Edwards also referred to the observation that in post-mortem studies it was possible to run injected material in a retrograde fashion down the vas as far as the epididymis, and that explained cases of "epididymitis from strain".

R. A. CRAVEN (Sydney) asked for how long Dr. Somerset would treat a patient who continued to have pus cells in his urine.

Dr. Somerset, in reply, said that that would depend on his estimate of the basic psychological make-up of the patient, and in any case he would not treat the patient for any longer than six weeks.

E. P. ROW (Brisbane) stressed that excretion urography was important in the examination of such patients, and he had recently seen an infected hydronephrosis and also renal calculi with infected urine in patients presenting as sufferers from chronic prostatitis.

Dr. Somerset, in reply, said that he was interested to hear Dr. Kirkland's and Dr. Edwards's views on the value of repeated prostatic massage for diagnosis. He thought that surgery was of no use once a fixed neurosis was present.

"Furadantin" Therapy.

COLIN EDWARDS (Sydney) read a paper entitled "Clinical Experience with 'Furadantin'" (see page 503).

ALEX INGLIS (Brisbane) said that Dr. Edwards's paper showed that "Furadantin" was a very valuable addition to the drugs available for the treatment of urinary tract infection. Its outstanding merit, in his opinion, was that it appeared to be effective against organisms that most other drugs would not touch. Certainly no other drug covered such a wide range. The fact that it was bactericidal instead of bacteriostatic was also greatly in its favour. Resistant mutants when they developed could be very troublesome. Dr. Inglis said that he had found the use of hexamine and mandelamine between courses of bacteriostatic drugs very useful. He preferred to use short, concentrated courses of sulphonamides or an antibiotic, and immediately to start on mandelamine, hexamine *et cetera* when the course was completed. After several days one could then either change the antibiotic or repeat the one first used.

Other excellent characteristics of "Furadantin" were its high solubility and the absence of any danger of crystallization. The greatest number (14) of Dr. Edwards's series of patients were infected with *Proteus vulgaris*. Dr. Inglis said that he had always considered that a most difficult organism to eradicate, and one that was very prone to recur. However, *Pseudomonas pyocyanea* still held pride of place in his estimation as the most difficult of all organisms to destroy, and in his bladder cases it was a very frequent and most unwelcome guest. He was surprised that there were no patients with that infection in the group studied. It would be difficult for him to find 23 cases without a high proportion of *Ps. pyocyanea* infections, and he would be interested to hear whether "Furadantin" was effective against that organism. Perhaps Dr. Edwards could answer that question for him. Of the 14 patients with *P. vulgaris* infections, nine were cured and five remained infected. That was an excellent result, and compared favourably with those obtained by other methods in use. Dr. Inglis then asked Dr. Edwards the following four questions: (i) whether "Furadantin" could be used in conjunction with, or be closely followed by sulphonamides and antibiotics; (ii) whether it was incompatible with alkalis and whether the pH of the urine in any way affected the result; (iii) whether "Furadantin" acted by its presence in the urinary tract, or through the blood-stream; (iv) how "Furadantin" dealt with *Ps. pyocyanea*.

O. J. ELLIS (Newcastle) reported an excellent result in one case of recurrent acute cysto-pyelitis in the female, and suggested that the society should do something about making it possible for "Furadantin" to be available to the general public.

J. S. PETERS (Melbourne) said that while "Furadantin" was useful against Proteus, *Ps. pyocyanea* had so many strains that it was unlikely that it could be often affected by "Furadantin". Dr. Peters said that "Chloropactin" was

excellent for bladder irrigation in cases of tuberculous cystitis and also in cases of interstitial cystitis.

Dr. Edwards, in reply, said that "Furadantin" could be used after sulphonamides or antibiotics or during their administration, and that the urinary pH was not important. Dr. Edwards said that he believed that the effect of "Furadantin" was through the urinary tract rather than through the blood-stream; for example, in one case the urinary tract infection had cleared, but a carbuncle had not been affected. No cases of *Ps. pyocyanea* infection had occurred in his series, so he was unable to discuss the effect of the drug in those infections.

Nephrocalcinosis.

VICTOR SAMPSON (Brisbane) read a paper entitled "Nephrocalcinosis" (see page 504).

Election of Office Bearers.

The names of the office bearers of the Executive Council for the ensuing twelve months were announced as follows:

President: M. S. S. Earlam.
Vice-President: E. P. Row.
Past President: Edgar Reay.
Honorary Secretary: L. D. Wheeler.
Honorary Treasurer: C. M. Edwards.
Members: H. H. Pearson, R. A. Craven, J. E. Blackman.

Induction of President and Past President's Address.

Dr. E. P. Row inducted Dr. M. S. S. Earlam, the President for 1956-1957, and delivered the Past President's address.

Out of the Past.

In this column will be published from time to time extracts, taken from medical journals, newspapers, official and historical records, diaries and so on, dealing with events connected with the early medical history of Australia.

A PIONEER DOCTOR AT BATHURST.[1]

Govt. House,
1 April, 1817.

To D'arcy Wentworth Esqr Principal Surgeon or Wm Redfern Esquire.

Dear Sir,

The Bearer Harry Seymour having been trained as a Surgeon and a Person of this description being much wanted at Bathurst[2] I have resolved to send him thither to be permanently stationed there until further orders as an assistant Surgeon. I therefore request you will be so good as to furnish him with a small assortment of medicines this evening, packed up in a small box to take with him thither, as he is to set out tomorrow morning in case the weather is good along with Mr. Evans for Bathurst.

Yours truly,
LACHLAN MACQUARIE.

[1] From the original in the Mitchell Library, Sydney.

[2] Macquarie had personally selected the site for the settlement at Bathurst in May, 1815.

Correspondence.

CORTISONE AND HYPERSENSITIVITY TO ANTIMICROBIALS IN TUBERCULOSIS.

SIR: Since chemotherapy in tuberculosis has become more and more universally used, reports of hypersensitivity to one or more of these agents have been increasing in frequency. Many authors, however, have published promising results following the use of cortisone or corticotrophin as a cover for the period of desensitization to the drug concerned.

In spite of this, numerous cases have been reported in American and English chest literature, in which the hypersensitivity persists even with the use of these steroids. To illustrate this, I would like to present the following two cases I had before I left England a few months ago; both of these present unusual features.

1. A man, aged fifty-one, with chronic bilateral pulmonary tuberculosis and a persistent, heavily positive sputum. He was hypersensitive to streptomycin and para-aminosalicylic acid, as well as isoniazid, the unusual feature being a reaction to all three drugs, INH included. Desensitization to the individual antimicrobials was attempted first using minimal gradually increasing doses. On each occasion a severe dermatitis developed as the larger doses were reached. Cortisone was therefore introduced as a cover, but once again a severe reaction developed as the higher doses were exhibited. Meanwhile there was no radiological deterioration, and chemotherapy was discontinued.

2. A man, aged forty, with active bilateral pulmonary disease. He developed a rather uncommon reaction to streptomycin—namely, diffuse cerebral encephalopathy. Similar cases on record, so far, are very few in number. It was thought that this was part of a severe generalized reaction that sometimes follows the use of these antimicrobials. The other typical findings of pyrexia, dermatitis and eosinophilia were also present. ACTH was commenced immediately with cessation of streptomycin. There was marked clinical improvement and the eosinophilia was reversed. The abnormal central nervous system signs persisted, however, and the patient died after three days.

There is no doubt that the use of cortisone or corticotrophin helps in overcoming the majority of similar reactions. Yet there is this percentage of more "intolerant" cases. It is still most desirable to treat these patients both for their own benefit and also to eliminate a vast reservoir of tubercle bacilli from the community.

It would appear that these patients, first and foremost, stand to benefit from the discovery of other equally potent antimicrobials, as yet another weapon on our side.

Yours, etc.,

Bodington Chest Hospital,
Wentworth Falls,
New South Wales.
March 19, 1957.

ALEX SALIBA.

EPISTEMOLOGY AND MEDICAL QUALIFICATION.

SIR: Thomas Linacre, the founder of the Royal College of Physicians of London, was born about 1460, and William Harvey in 1578, and both were educated at King's School, Canterbury, Kent.

Linacre was a Fellow of All Souls' College, Oxford, but took his M.D. at Padua. Harvey took his degree in arts at Caius College, Cambridge, and also studied at Padua, and took his M.D. in 1602.

Lettsom and his fellow Quaker, Dr. Fothergill, founded the Medical Society of London in 1773, and Lettsom endowed the "Fothergillian Medal" in honour of his friend.

Lettsom was unfairly lampooned in the crude spirit of the age, thus:

When folks is sick they comes to I.
I physics, bleeds and sweats 'em;
And, if in spite of that, they die—
What's that to I? I lets 'em.

Yours, etc.,

"Egmont",
Wolseley Road,
Point Piper.
March 30, 1957.

C. R. HODGSON.

SIR: Dr. Raymond Hennessy (M. J. AUSTRALIA, March 30, 1957) either agrees or disagrees with my protest against the suppression of individualism in medical practice. He does not commit himself. I would concede him a technical knockout on trivia, except for his own errors in his criticism of my letter (M. J. AUSTRALIA, February 23, 1957).

Henry Havelock Ellis, who, at the age of thirty, gained his L.S.A. in 1889, states ("My Life", page 201—footnote): "It is quite true, I may add, that the L.S.A. while an adequate qualification, confers no prestige. That only came nearly fifty years later when, under a special rule, the Royal College of Physicians conferred on me the unexpected honour of Fellowship"—that is, just in time to put "F.R.C.P." on the tombstone of a man of 80.

Sir Alexander MacCormick became an honorary Fellow of the English and Edinburgh Colleges of Surgeons—so what? My contention is that he demonstrated and achieved success without these distinctions; to put it another way, he honoured those Colleges by permitting them to confer the Fellowships after he had no academic reason for accepting them. I suspect, Dr. Hennessy, that you are with me (and Shakespeare) in this argument against the insolence of office.

My confusion about J. C. Lettsom, the founder of the Medical Society of London when the Royal College of Physicians was dormant, arose from the following contemporary verse:

> And when my patients come to me
> I purges, bleeds and sweats 'em,
> But when their time has come to die—
>
> I. LETTSOM.

My original hastily written letter was provoked by a multi-coloured brochure of pamphlets from the New South Wales Branch of the British Medical Association, and from one of the more delicately tinted leaflets of this polychromatic sheaf, which for a reason best known to its author, is called "Newsletter No. 1", reading an otherwise incoherent effusion, I was galvanized by the words "specialist general surgeon".

As every specialist knows, the skin belongs to the plastic surgeon (with tantalum braid suture at £13 a box, I agree with that); such of the brain as is left by the psychiatrist, the psychologist and the neurologist is the exclusive preserve of the neurosurgeon. Offal belongs to the cardiac surgeon, the thoracic surgeon or the surgical gastro-enterologist, after the urologist and gynæcologist have been given honour due. The bones and muscles obviously go to the orthopædic surgeon, although the greatest of them all, Sir Reginald Watson-Jones, remarks: "There are physicians of the body and physicians of the mind, but the two are one and indivisible."

As if to emphasize the absurdity, a drug house pamphlet arrived in the same mail as the British Medical Association's "chameleon", and announced the advent of a new specialist, the trachomatologist, who need never let his spiritual footsteps stray from the conjunctival sac.

Obviously the facets of medicine can be reduced to Leibnitz's[1] "windowless monads", each occupied by an appropriately specialized specialist leaving the unfortunate "specialist general surgeon" (of "Newsletter No. 1") with nothing to do whatever. After all, medicine, even if it is among the noblest of human arts, is only a very minor applied science and easily acquired.

The universities and the British Medical Association have the knowledge, dignity and authority to reintegrate our profession, and while it remains true that the problem is partly political, partly legal and only partly medical, the difficulties must be overcome. Our legislators are not fools, our lawyers are not venal, nor are we.

Initiative will perish if medical practice disintegrates into the sort of fragmented absurdity where the general practitioner goes Jehu-taxiing to have dockets signed by pensioners until his pen, his petrol tank or (more probably) the Treasury run dry!

The problem is urgent, it is serious and it is danerous,[2] but it must be solved unless the doctor is to become a conditioned automaton—a medically trained "shopwalker-taxi-driver", directing "cases" to relays of peripherally scotomatous technicians, who, the nature of man being what it is, will quickly be transformed into a hungry, conceited rabble of "legally" qualified monopolists.[3]

May I inquire if the Association agrees with the departmentalization of medicine, and if so, what is meant by a "specialist general surgeon"?

Yours, etc.,

GODFREY HARRIS.

Sydney,
March 30, 1957.

[This correspondence is now closed.—EDITOR.]

[1] Leibnitz invented the present technique of mathematical philosophy.

[2] The then Lieutenant-Colonel W. S. Churchill, during World War I, was warned by a senior officer that the position he was occupying was dangerous. "But", replied Churchill, "this is a dangerous war!"

[3] Occam's razor may be needed in the Brave New World, to separate medicine and dentistry when the gingivologist meets the periodontist. Here Dr. Hennessy, with his almost unique qualifications, could help me.

Post-Graduate Work.

THE POST-GRADUATE COMMITTEE IN MEDICINE IN THE UNIVERSITY OF SYDNEY.

POST-GRADUATE CONFERENCE AT BATHURST.

THE Post-Graduate Committee in Medicine in the University of Sydney announces that a post-graduate conference will be held at Bathurst, in conjunction with the Western District Medical Association, on Saturday and Sunday, April 27 and 28, 1957. The programme is as follows:

Saturday, April 27: 2 p.m., registration; 2.30 p.m., "Cancer of the Breast", Dr. Justin Fleming; 4 p.m., "Hepatitis and the Effect of Treatment on its Course", Dr. V. J. McGovern.

Sunday, April 28: 9.30 a.m., symposium, "Thrombosis and Embolism"; speakers, Dr. Justin Fleming, Dr. V. J. McGovern, Dr. R. Cameron; 11.30 a.m., clinico-pathological conference, Dr. V. J. McGovern; 2 p.m., "The Current Management of Peripheral Vascular Disease", Dr. Justin Fleming.

The fee for attendance at the course will be £3 3s., and those wishing to attend are requested to notify Dr. Brooke Moore, 142 William Street, Bathurst, as soon as possible. Telephone: Bathurst 2345.

POST-GRADUATE CONFERENCE AT NEWCASTLE.

The Post-Graduate Committee in Medicine in the University of Sydney announces that, in conjunction with the Central Northern Medical Association, it has been decided to hold the 1957 post-graduate conference at The Royal Newcastle Hospital in three sections, as follows: (*a*) gynæcology and obstetrics (April), (*b*) medicine (August), (*c*) surgery (October).

The gynæcological and obstetrical section will be held on Saturday and Sunday, April 27 and 28, 1957, and the speakers will be Dr. R. J. F. McInerney and a local practitioner. Details of the programme will be available shortly.

The combined fee for attendance will be £3 3s., or £1 1s. for each section, and those wishing to attend are requested to notify Dr. Craig Horn, Honorary Secretary, Central Northern Medical Association, 17 Bolton Street, Newcastle, as soon as possible. Telephone: Newcastle B 2808.

COURSE FOR PART I D.D.M., 1957.

The Post-Graduate Committee in Medicine in the University of Sydney announces that a course for Part I of the Diploma in Dermatological Medicine will begin on May 13, 1957, for a period of twelve weeks.

The fee for attendance will be £36 15s., and further details may be obtained on application to the Course Secretary, The Post-Graduate Committee in Medicine, 131 Macquarie Street, Sydney. Telephones: BU 4497-8.

PROGRAMME OF THE GENERAL REVISION COURSE.

The Post-Graduate Committee in Medicine in the University of Sydney announces the following scientific programme for the general revision course, to be held for two weeks from May 6, 1957:

Monday, May 6. In the Stawell Hall, 145 Macquarie Street, Sydney: 9.15 a.m., registration. 9.45 a.m., opening of course. 9.55 a.m., election of chairman. 10 a.m., review of course. 10.10 a.m., group photograph of members. 10.45 a.m., "Infectious Hepatitis", Dr. A. W. Morrow. 11.45 a.m., "Hypertension", Dr. James Isbister. 2.15 p.m., symposium, "Inflammatory Diseases of the Alimentary Tract"; chairman, Professor C. R. Bickerton Blackburn; "Enteritis and Other Related Diseases in Children", Dr. D. Kerr Grant; "Œsophagitis", Dr. G. V. Hall; "Colitis", Dr. Stanley Goulston; discussion.

Tuesday, May 7. In the Stawell Hall, 145 Macquarie Street, Sydney: Symposium, "Common Skin Diseases in General Practice"; chairman, Dr. Ewan Murray-Will. 9.15 a.m., "The Management of Birthmarks", Dr. J. C. Belisario. 9.35 a.m., "Chronic Paronychia", Dr. W. Keith Myers. 9.50 a.m., "Diagnosis of Occupational Skin Disorders", Dr. C. F. Robinson. 10.45 a.m., "The Use of Steroids in Dermatology", Dr. R. F. A. Becke. 11.5 a.m., "Pyogenic Skin Infections", Dr. A. G. Finley. 11.25 a.m., discussion. 11.45 a.m., "Steroid Therapy", Dr. Selwyn Nelson. 2.15 p.m., "Some Occupational Health Problems in General Practice", Dr. Gordon Smith. 3.45 p.m., "Rheumatoid Arthritis", Dr. Ralph Reader.

Wednesday, May 8. In the Stawell Hall, 145 Macquarie Street, Sydney: 9.15 a.m., "Medical Aspects of Asthma", Dr. H. Maynard Rennie. 10.45 a.m., "Stammering and Other Speech Problems", Dr. D. W. H. Arnott. 11.45 a.m., "Thrombo-embolic Disease", Dr. J. Kempson Maddox and Dr. Alan Sharp. 2.15 p.m., "Early Management of Paraplegia and the Rehabilitation of the Paraplegic", Dr. R. A. Money. 3.40 p.m., symposium, "Strokes and Apoplexy"; chairman, Dr. C. G. McDonald; speakers, Dr. S. M. Morson, Dr. W. J. Burke, Dr. J. L. Allsop. 8.15 p.m., symposium, "New Drugs and Therapeutic Measures"; chairman, Dr. Wilfred Evans; speakers, Dr. T. M. Greenaway, Dr. A. W. Morrow, Dr. F. Hales Wilson, Dr. Malcolm Whyte.

Thursday, May 9. In the Stawell Hall, 145 Macquarie Street, Sydney: Symposium, "Psychiatric Problems in General Practice"; chairman, Dr. W. S. Dawson. 9.15 a.m., "Psychosomatic Problems", Dr. David Ross. 10.45 a.m., "Prevention and Treatment of Behaviour Disturbances in Children", Dr. A. N. Jennings. 11.45 a.m., "Management of the Relatives of Mentally Ill Patients", Dr. Ian Simpson. At Broughton Hall Psychiatric Clinic, Leichhardt: 2.15 p.m., demonstration of psychiatric problems in general practice by Professor W. H. Trethowan and the staff.

Friday, May 10. In the Stawell Hall, 145 Macquarie Street, Sydney: 9.15 a.m., "Cardiac Infarction" (with electrocardiographic demonstration), Dr. Frank L. Ritchie. 10.45 a.m., "X-Ray Conference"; chairman, Dr. Selwyn Nelson; speakers, Dr. Alexander Owen and Dr. P. H. Greenwell. 11.45 a.m., film session. Free afternoon (see M. J. AUSTRALIA, March 23, 1957, at page 402).

Saturday, May 11. At the Red Cross Blood Transfusion Centre, 1 York Street, Sydney: 9.30 a.m., demonstrations of blood grouping, Rh testing and blood transfusion techniques, Dr. Hugh K. Ward and Dr. R. J. Walsh.

Monday, May 13. In the Stawell Hall, 145 Macquarie Street, Sydney: 9.15 a.m., "Staphylococcal Infection in the Newborn", Dr. S. E. L. Stening. 10.45 a.m., "Staphylococcal Pneumonia and Empyema", Dr. D. G. Hamilton and Dr. John Harley. 11.45 a.m., "The Changing Pattern and the Surgical Management of Staphylococcal Empyema and Staphylococcal Osteomyelitis", Dr. J. Steigrad and Dr. David L. Dey. At the Lecture Theatre, Royal Alexandra Hospital for Children, Camperdown: 2.15 p.m., discussion of some common clinical problems, Professor Lorimer Dods. 3.45 p.m., "Present-Day Attitude Towards the Problem of the Undescended Testis", Dr. J. Steigrad and Dr. John Gibson.

Tuesday, May 14. In the Stawell Hall, 145 Macquarie Street, Sydney: Symposium, "Gynæcological Problems in General Practice"; chairman, Dr. George Stening. 9.15 a.m., "The Clinical Approach to Sterility Problems", Dr. Alan Grant. 10 a.m., "Pelvic Cancer", Dr. J. Cameron Loxton. 11.15 a.m., "The Significance of Pruritus Vulvæ", Dr. Malcolm Stening. 12 noon, "Differentiation of Pelvic Pain", Dr. Malcolm Drummond. Symposium, "Obstetrical Problems in General Practice"; chairman, Dr. J. N. Chesterman. 2.15 p.m., "Newer Drugs in Toxæmia of Pregnancy", Dr. K. S. Richardson. 2.40 p.m., "Post-Partum Hæmorrhage", Dr. A. A. Moon. 3 p.m., "Post-Maturity", Dr. F. A. Bellingham. 3.45 p.m., "The Technique of Breech Delivery" (with film), Dr. G. E. Cummins. 4.15 p.m., discussion.

Wednesday, May 15. In the Stawell Hall, 145 Macquarie Street, Sydney: 9.15 a.m., "Ophthalmology in General Practice", Sir Norman McAlister Gregg. 10.45 a.m., "Hearing Defects in Children", Dr. Patricia Davey. 11.45 a.m., "Relaxation", Dr. L. T. Shea. 12 noon, "Problems of Obstetrical Anæsthesia", Dr. Janet Bowen. 12.15 p.m., "Some Anæsthetic Emergencies", Dr. Douglas Joseph. 12.30 p.m., discussion. 2.15 p.m., "Urology in General Practice", Dr. John McNamara. 3.45 p.m., "Fractures in General Practice", Dr. A. R. Hamilton.

Thursday, May 16. In the Stawell Hall, 145 Macquarie Street, Sydney: 9.15 a.m., "Disorders of the Hip Joint", Dr. Hugh Barry. 10.45 a.m., "Backache", Dr. Norman Little. 11.45 a.m., "Painful Foot", Dr. Eric Hedberg; symposium, "Indications for Operation"; chairman, Dr. V. M. Coppleson. 2.15 p.m., "Thyroid", Sir Hugh Poate. 2.30 p.m., "Gall-Bladder", Dr. P. J. Kenny. 2.45 p.m., "Gastric and Duodenal Ulcers", Dr. S. H. Lovell. 3 p.m., "Congenital Hypertrophic Pyloric Stenosis", Dr. Eric Goulston. 3.15 p.m., "Varicose Veins", Dr. V. M. Coppleson. 4 p.m., "Appendix", Dr. Frank H. Mills. 4.15 p.m., film session.

Friday, May 17. In the Stawell Hall, 145 Macquarie Street, Sydney: 9.15 a.m., "Sporting Injuries", Dr. W. D. Sturrock. 10.40 a.m., question time; chairman, the honorary director, Dr. V. M. Coppleson; panel, Dr. Angus Murray, Dr. George Stening, Dr. A. E. McGuinness.

ANNUAL SUBSCRIPTION COURSE.

The Post-Graduate Committee in Medicine in the University of Sydney announces that the following programmes have been arranged during April and May, 1957.

Professor J. M. Robson.

Professor J. M. Robson, M.D., D.Sc., Professor of Pharmacology at Guy's Hospital Medical School, London, and 1957 Visiting Professor of Pharmacology, will give the following lectures: Monday, April 15, at 8 p.m., at the Wallace Theatre, University of Sydney: "The Discovery of Drugs." Wednesday, April 17, at 8 p.m., at the new Barn Theatre, New Medical School, University of Sydney: "The Chemical Control of Cells." Wednesday, April 24, at 8 p.m., at the new Barn Theatre, New Medical School: "The Absorption and Fate of Drugs in the Body." (This lecture will be held in conjunction with the Pharmaceutical Society of New South Wales.) Monday, April 29, at 8 p.m., at the new Barn Theatre, New Medical School: "New Hormones for Old." Thursday, May 2, at 8 p.m., at the new Barn Theatre, New Medical School: "The Chemotherapy of Tuberculosis." Thursday, May 16, at 8 p.m., at the new Barn Theatre, New Medical School: "Tranquillizing Drugs." Professor Robson will also take part in a seminar to be held in the Maitland Lecture Theatre, Sydney Hospital, on Wednesday, May 1, at 2.15 p.m.

These lectures have been made available to members of the annual subscription course through the courtesy of Professor R. H. Thorp and the Department of Pharmacology of the University of Sydney.

Dr. S. Whately Davidson and Dr. John F. Bromley.

Dr. S. Whately Davidson, M.D., F.R.C.P., F.F.R., Physician-in-Charge, Radiological Department, Royal Victoria Infirmary, Newcastle-on-Tyne, and Dr. John F. Bromley, O.B.E., F.R.C.P., F.F.R., D.M.R.E., Director, Radiotherapy Department, Birmingham United Hospitals, will give the following lectures, which have been arranged by the Post-Graduate Committee in conjunction with The College of Radiologists of Australasia: Monday, May 6, at 8.15 p.m., Stawell Hall, 145 Macquarie Street: "Some Considerations in the Differential Diagnosis of Shadows Associated with the Mediastinum", Dr. S. Whately Davidson. Monday, May 13, at 8.15 p.m., Stawell Hall, 145 Macquarie Street: "Tumour of the Ovary" and "Testicular Tumours" (combined lecture), Dr. John F. Bromley.

Sir James Paterson Ross.

Sir James Paterson Ross, K.C.V.O., F.R.C.S., Sims Commonwealth Travelling Professor for 1957, will give the following lectures in the Stawell Hall, 145 Macquarie Street, Sydney, at 8.15 p.m., on the following dates: Tuesday, May 14, "The Changing Scope of Surgery"; Friday, May 17, "Inflammatory and Idiopathic Œdema". These lectures are held in conjunction with the New South Wales Committee of The Royal Australasian College of Surgeons, and members of the annual subscription course are invited to attend.

Mr. C. P. Wilson.

Mr. C. P. Wilson, C.V.O., F.R.C.S., Senior Ear, Nose and Throat Surgeon, Middlesex Hospital, London, and Director of the Ferens Institute of Pathology, will visit Sydney from June 9 to 17. Mr. Wilson will give the following lectures in the annual subscription course, which have been arranged in conjunction with the Oto-Laryngological Society of Australia. The lectures will be given in the Stawell Hall, 145 Macquarie Street, Sydney, on the following dates: Tuesday, June 11, 8.15 p.m., "Post-Nasal Tumours"; Wednesday, June 12, 8.15 p.m., "Sneezing, Snuff and Smoking"; Thursday, June 13, 8.15 p.m., "Laryngeal Paralyses"; Wednesday, June 12, 2.15 p.m., seminar, Maitland Lecture Theatre, Sydney Hospital, "Cancer of the Hypopharynx".

Symposium: "New Drugs and Therapeutic Measures."

A symposium, "New Drugs and Therapeutic Measures", will be held in the Stawell Hall, 145 Macquarie Street, Sydney, on Wednesday, May 8, at 8.15 p.m. This symposium, which is part of the annual general revision course, will be open to members of the annual subscription course.

General Information.

The annual subscription course covers attendance at lectures by overseas lecturers and other specially arranged activities. The annual fee is £2 2s. from July 1. The fee for resident medical officers is £1 1s. Occasionally last-

minute alterations to meetings are necessary, and these are notified by advertisement in *The Sydney Morning Herald* ("Public Lectures"), if possible on the day before the meeting.

WEEK-END COURSE IN GASTRO-ENTEROLOGY.

The Post-Graduate Committee in Medicine in the University of Sydney announces that a week-end course in gastro-enterology for general practitioners will be held in the Scot Skirving Lecture Theatre, Royal Prince Alfred Hospital, Camperdown, on Saturday and Sunday, June 22 and 23, 1957, under the chairmanship of Dr. A. W. Morrow. The programme is as follows:

Saturday, June 22: 9.30 to 10 a.m., "Management of Uncomplicated Peptic Ulcer", Dr. Stanley Goulston; 10.45 a.m., "Management of Acute Gastro-Duodenal Hæmorrhage", Dr. R. S. Packard; 11.30 a.m. to 12 noon, "Management of Acute and Recurrent Pancreatitis", Dr. E. V. Barling; 12.15 to 12.45 p.m., "Management of Fluid and Electrolyte Loss from the Alimentary Tract", Professor C. R. B. Blackburn.

Sunday, June 23: 9.30 to 10 a.m., "Modern Concepts of the Anatomy and Physiology of the Liver", Dr. Douglas Piper; 10.15 to 10.45 a.m., "The Histology of the Liver and its Reaction to Disease", Dr. V. J. McGovern; 11.30 a.m. to 12.45 p.m., "The Management of (*a*) Uncomplicated Infectious Hepatitis, (*b*) Progressive Hepatitis, (*c*) Drug-Induced Hepatitis", Dr. A. W. Morrow, Dr. Stanley Goulston; 2 to 3 p.m., "The Clinical Picture and Management of Obstruction of the Biliary Tract", Professor J. Loewenthal, Dr. B. P. Billington; 4 to 5 p.m., "The Clinical Picture and Management of Hepatic Coma", Dr. A. Skyring, Dr. D. Church.

The fee for attendance is £3 3s. Those wishing to attend are requested to make written application, enclosing remittance, to the Course Secretary, Post-Graduate Committee in Medicine, 131 Macquarie Street, Sydney. Telephone: BU 4497-8.

THE POST-GRADUATE GOLF CUP.

The competition for the Post-Graduate Golf Cup will take place on Friday, May 17, 1957, at the Royal Sydney Golf Club, Rose Bay. Particulars and application forms may be obtained from the Post-Graduate Committee.

THE ALFRED HOSPITAL, MELBOURNE.

Post-Graduate Course in Medicine.

THE honorary medical staff of the Alfred Hospital, Prahran, Victoria, will conduct a post-graduate course in medicine, suitable for candidates for higher medical qualifications such as M.D. II and M.R.A.C.P. This course will run for eight weeks from June 3 to July 27, 1957, and sessions will be held each day from noon till 1 p.m. and from 2 p.m. to 5.15 p.m. Sessions will also be held from 9.30 a.m. to noon on Saturdays. On Mondays, Tuesdays, Thursdays and Fridays the afternoons will be devoted to lectures and clinical presentations. Members of the class will present to the physician the findings of the clinical examinations carried out in the mornings. Discussion of the case will follow. At other times the physician in charge will give pathological presentations of cases. Didactic lectures followed by discussion will occupy portion of these afternoons. Wednesday afternoons will be occupied by presentation of pathological specimens and case demonstrations in certain branches of medicine. Morning sessions will be occupied by pathology, ophthalmology, dermatology, electrolyte physiology, allergy, industrial medicine, medical radiology, electrocardiography *et cetera*. Eight seminars on medical and surgical subjects have been arranged for Saturday mornings.

Enrolments, accompanied by the fee payable, should be made with the Director of the Melbourne Medical Post-Graduate Committee, 394 Albert Street, East Melbourne (FB 2547). Entries will be received up till May 17, 1957. The fee for the whole course is £31 10s., and for individual lectures 15s. per lecture. Attendance at Saturday sessions is free.

DISEASES NOTIFIED IN EACH STATE AND TERRITORY OF AUSTRALIA FOR THE WEEK ENDED MARCH 23, 1957.[1]

Disease.	New South Wales.	Victoria.	Queensland.	South Australia.	Western Australia.	Tasmania.	Northern Territory.	Australian Capital Territory.	Australia.
Acute Rheumatism	4(2)	2(1)	1(1)	..	..	..	..	..	7
Amœbiasis	..	..	..	..	..	..	..	..	..
Ancylostomiasis	..	..	1(1)	..	..	..	..	..	1
Anthrax	..	..	..	..	..	..	..	..	..
Bilharziasis	..	..	..	..	..	..	..	..	..
Brucellosis	..	..	..	..	..	..	..	..	..
Cholera	..	..	..	..	..	..	..	..	..
Chorea (St. Vitus)	..	..	..	..	..	..	..	..	..
Dengue	..	..	..	..	..	..	..	..	..
Diarrhœa (Infantile)	11(10)	6(6)	3(3)	..	..	..	..	..	20
Diphtheria	4(2)	4(4)	..	..	1(1)	..	..	..	9
Dysentery (Bacillary)	..	2(2)	4(4)	4(4)	1	..	..	..	11
Encephalitis	..	..	..	..	..	..	..	..	..
Filariasis	..	..	..	..	..	..	..	..	..
Homologous Serum Jaundice	..	..	..	..	..	..	..	..	..
Hydatid	..	..	..	..	..	..	..	..	..
Infective Hepatitis	44(28)	23(10)	..	1(1)	7(2)	4(2)	2	1	82
Lead Poisoning	..	..	..	..	..	..	..	..	..
Leprosy	..	..	..	..	..	..	..	..	..
Leptospirosis	..	..	2	..	..	..	..	..	2
Malaria	..	..	2(2)	..	..	..	..	..	2
Meningococcal Infection	2(1)	1(1)	..	..	..	..	..	..	3
Ophthalmia	..	..	..	..	..	..	3	..	3
Ornithosis	..	..	..	..	..	..	..	..	..
Paratyphoid	..	..	..	..	..	..	..	..	..
Plague	..	..	..	..	..	..	..	..	..
Poliomyelitis	3(2)	..	2	..	1(1)	..	..	..	6
Puerperal Fever	..	..	..	..	..	..	..	..	..
Rubella	..	22(18)	..	7(3)	4(4)	..	..	..	33
Salmonella Infection	..	..	..	..	..	..	..	..	..
Scarlet Fever	5(2)	14(8)	1	2	1(1)	..	..	1	24
Smallpox	..	..	..	..	..	..	..	..	..
Tetanus	..	1	..	1	..	..	..	..	2
Trachoma	..	..	..	..	7	..	..	..	7
Trichinosis	..	..	..	..	..	..	..	..	..
Tuberculosis	27(12)	14(9)	11(5)	4(4)	12(9)	2(2)	..	..	70
Typhoid Fever	1(1)	..	..	..	1(1)	..	..	..	2
Typhus (Flea-, Mite- and Tick-borne)	..	..	..	..	..	..	..	..	..
Typhus (Louse-borne)	..	..	..	..	..	..	..	..	..
Yellow Fever	..	..	..	..	..	..	..	..	..

[1] Figures in parentheses are those for the metropolitan area.

The College of Radiologists of Australasia.

EXAMINATION RESULTS.

THE following candidates were successful in the March, 1957, examinations of The College of Radiologists of Australasia, Part II, for membership of the College:

Radiodiagnosis: Dr. W. H. Benson (South Australia), Dr. A. H. B. Clarke (Victoria), Dr. J. D. Harrington and Dr. F. M. Stackpool (New South Wales) and Dr. T. S. Weston (New Zealand).

Radiotherapy: Dr. Neva M. Johnson (Victoria).

Notice.

BRITISH MEDICAL ASSOCIATION: NEW SOUTH WALES BRANCH.

Result of Council Election.

THE following members have been elected to the Council of the New South Wales Branch of the British Medical Association for the period 1956-1957:

Representative of Women Members: Dr. Clair Isbister.

Representative of Public (Government) Medical Service Members: Dr. H. H. Willis.

Representatives of Country Local Associations: Dr. B. A. Cook, Dr. B. W. Monahan.

Representatives of Metropolitan Local Associations: Dr. K. S. Jones, Dr. C. R. M. Laverty.

Representatives of the General Body of Members: Dr. M. S. Alexander, Dr. D. A. Brown, Dr. J. F. C. C. Cobley, Dr. D. G. Hamilton, Dr. P. J. Kenny, Dr. R. H. Macdonald, Dr. A. W. Morrow, Dr. A. J. Murray, Dr. T. Y. Nelson, Dr K. C. T. Rawle, Dr. W. F. Simmons, Dr. R. J. J. Speight, Dr. W. S. Stuckey, Dr. P. A. Tomlinson, Dr. D. A. Warden, Dr. Weeks White.

Research.

NUFFIELD FOUNDATION AUSTRALIAN ADVISORY COMMITTEE.

THE Chairman of the Nuffield Foundation Australian Advisory Committee, Mr. Colin Syme, has announced that Nuffield Dominion Travelling Fellowships in Medicine have been awarded to Dr. Jonathan Peter Halliday, of Sydney, Dr. Thomas Bruce Lindsay, of Adelaide, and Dr. Kenneth Hay McLean, of Melbourne.

Nominations and Elections.

THE undermentioned have applied for election as members of the New South Wales Branch of the British Medical Association:

Cabrera, Kenneth Francis, M.B., B.S., 1956 (Univ. Sydney), 39 Eastbourne Road, Homebush West, New South Wales.

Barnes, Jack Felstead, M.B., B.S., 1954 (Univ. Sydney), 68 Macquarie Street, Parramatta, New South Wales.

Griffiths, Nancy Olive, M.B., B.S., 1942 (Univ. Adelaide), Box 1, Queanbeyan, New South Wales.

Dabrowski, Edward, registered in accordance with the provisions of Section 17 (2) of the *Medical Practitioners Act*, 1938-1955, Flat 4, 272 Birrell Street, Bondi, New South Wales.

Congresses.

THIRD WORLD CONGRESS OF CARDIOLOGY.

THE third World Congress of Cardiology is to be held at Brussels from September 14 to 21, 1958. The Secretary is Dr. Fr. van Dooren, 80, rue Mercelis, Brussels.

Further particulars and application forms, when available, may be obtained from Dr. J. M. Gardiner, secretary and treasurer of the Australasian Cardiac Society. His address is Alfred Hospital, Commercial Road, Prahran, S.1, Victoria.

Deaths.

THE following deaths have been announced:

NEWTON-TABRETT.—Alice Sarah Newton-Tabrett, on March 24, 1957, at Roseville, New South Wales.

JONES.—Isaac Jones, on March 24, 1957, at London.

Diary for the Month.

APRIL 15.—Victorian Branch, B.M.A.: Finance Subcommittee.
APRIL 16.—New South Wales Branch, B.M.A.: Medical Politics Committee.
APRIL 17.—Western Australian Branch, B.M.A.: General Meeting.
APRIL 18.—Victorian Branch, B.M.A.: Executive of Branch Council.
APRIL 23.—New South Wales Branch, B.M.A.: Ethics Committee.

Medical Appointments: Important Notice.

MEDICAL PRACTITIONERS are requested not to apply for any appointment mentioned below without having first communicated with the Honorary Secretary of the Branch concerned, or with the Medical Secretary of the British Medical Association, Tavistock Square, London, W.C.1.

New South Wales Branch (Medical Secretary, 135 Macquarie Street, Sydney): All contract practice appointments in New South Wales.

Queensland Branch (Honorary Secretary, B.M.A. House, 225 Wickham Terrace, Brisbane, B17): Bundaberg Medical Institute. Members accepting LODGE appointments and those desiring to accept appointments to any COUNTRY HOSPITAL or position outside Australia are advised, in their own interests, to submit a copy of their Agreement to the Council before signing.

South Australian Branch (Honorary Secretary, 80 Brougham Place, North Adelaide): All contract practice appointments in South Australia.

Editorial Notices.

MANUSCRIPTS forwarded to the office of this journal cannot under any circumstances be returned. Original articles forwarded for publication are understood to be offered to THE MEDICAL JOURNAL OF AUSTRALIA alone, unless the contrary be stated.

All communications should be addressed to the Editor, THE MEDICAL JOURNAL OF AUSTRALIA, The Printing House, Seamer Street, Glebe, New South Wales. (Telephones: MW 2651-2-3)

Members and subscribers are requested to notify the Manager, THE MEDICAL JOURNAL OF AUSTRALIA, Seamer Street, Glebe, New South Wales, without delay, of any irregularity in the delivery of this journal. The management cannot accept any responsibility or recognize any claim arising out of non-receipt of journals unless such notification is received within one month.

SUBSCRIPTION RATES.—Medical students and others not receiving THE MEDICAL JOURNAL OF AUSTRALIA in virtue of membership of the Branches of the British Medical Association in the Commonwealth can become subscribers to the journal by applying to the Manager or through the usual agents and booksellers. Subscriptions can commence at the beginning of any quarter and are renewable on December 31. The rate is £5 *per annum* within Australia and the British Commonwealth of Nations, and £6 *per annum* within America and foreign countries, payable in advance.